July 1939

RADIO AND HOBBIES IN AUSTRALIA

VOL. 1 No. 4

In this issue

A "WIRELESS WEEKLY" PUBLICATION

With the Editors

RADIO FOR BUSH-FIRE WORK

Elsewhere in this issue you will find an article dealing with the use of radio transmitting and receiving sets as an aid to Bush-Fire fighters. It seems to us that invaluable work could be done with equipment of this nature—work not possible with any other form of communication. The Bush-Fire menace is one which, it seems, will always be with us. Millions of pounds must be exposed to risk every year, through the possibility of such fires. To say nothing of the human lives which are regularly lost when the flames sweep down on timber camps and outlying towns.

As we have pointed out in our article, Victoria is taking steps to enlist radio in fighting the fires. No other method is free from wires, which are likely to be destroyed or broken, nor can any other provide the instant relay of messages in situations where speed is everything.

It is difficult to see why Australian-made apparatus, designed by Australian radio engineers, should not be used in New South Wales, or for that matter, anywhere else in Australia. It needs but little imagination to picture the vastly improved organisation of land and air-parties, once these are provided with a means of speaking to each other, despite dense smoke and wild country. Experiment to determine which wavelength and apparatus will be most suitable to use, is merely a routine matter.

We ourselves have enough knowledge and experience of amateur radio transmitting to know that nothing stands in the way of steps being taken NOW before there is any urgent need. With apparatus ready, and organisation complete, there is not the slightest doubt that radio will make an enormous difference in limiting damage which the fires will cause. At the very least, it should play a big part in preventing loss of life. If every settlement likely to be threatened were provided with emergency radio, for instance, what a God-send that might be!

We hope immediate steps will be taken, by those responsible, to see that something is done about it. So far, there is every indication that the idea is favorably considered, and will, sooner or later, be adopted. Let us hope it will be sooner!

NEXT MONTH

In next month's issue, we hope to present several special features for radio enthusiasts. One of these will be a real midget receiver, of four valves, for reception on the broadcast band, and A.C. operated. There is every evidence that this type of receiver will be widely used in the immediate future, and we intend that our readers shall be given the opportunity to build one for themselves. The price should not be more than about £1 complete, possibly less. Secondly, we have "on the ice," an entirely new short-wave receiver for the short-wave fan, complete with switched-coil and every modern convenience. Don't miss our next issue at any price. And there will be more—much more—about Model Planes!

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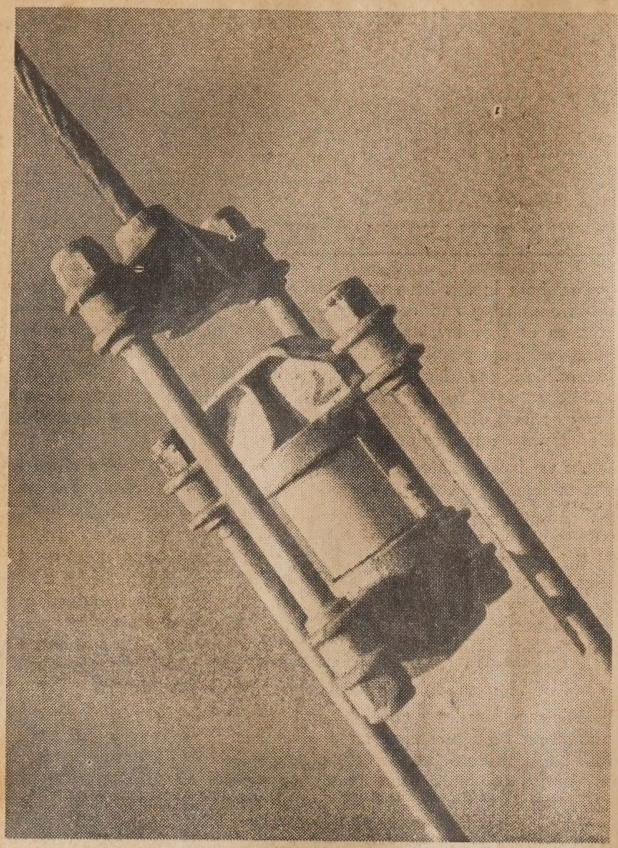
WHEN IS



A fine picture of an insulator of the type used to break up the guy wires. A man can scarcely lift it.

At Liverpool, Meadowbank, and Dundas, you will see the aerials of 2FC, 2GB, and 2SM. At first glance, all you will see at any of these places will be a tall steel mast. If you look for the usual aerial wires, you will be disappointed. For these stations use masts which are themselves aerials—specially designed that way for efficiency. This article tells you about one of them—that to be found at 2GB.

TRANSMITTING aerials, unlike receiving aerials, must bear some relationship in their dimensions to the wavelength or frequency of the transmitter. Their natural frequency, at which they will be energised most easily, must be selected so that when the transmitter is connected there is a good transfer of radio-frequency power.

When the aerial is connected up and the transmitter is turned on its power is radiated out into the ether. The size of the aerial, and its angle to the vertical or horizontal plane, will determine the directions in which most power is radiated. It is not correct to imagine that all aerials radiate in all directions at the same strength. A very long aerial, strung horizontally, might have four or more distinct "lobes" in its field pattern, if we cared to draw a diagrammatic representation of the power which leaves it.

VERTICAL MASTS

The use of vertical masts as aerials is a comparatively recent development. In the past, stations have used various types of wire aerials strung up between two points, and falling into various technical classifications. Many stations still use such aerials, and they operate very well.

But measurements of the "field strength" of a station using such an aerial demonstrates that in many cases a good deal of the station's power is being radiated out where it is not required to travel. It is obvious that if all the power radiated from any one station could be concentrated to serve only the area it was desired to cover, the maximum efficiency per listener would be obtained.

Before discussing the construction of the vertical aerial let us consider why it is often used.

WHY IT IS USED

Now, many stations are operated with the idea of serving with maximum strength the areas immediately in the vicinity. A transmitter located in Sydney can't hope to give much of a service out in the country, nor would it gain much by trying.

Consequently, if it can use an aerial which will concentrate this field pattern on the city and suburbs it will waste the least possible power.

It is for this reason that the vertical aerial has become popular with many stations. Because if we are using such an aerial, if it is made equal to half the wavelength of the station, or some length in harmonic relation to it, and less than one half-wavelength, most of its energy is shot out equally in all directions, and at a low angle to the ground.

Immediately above the aerial there will be very little radiation at all, and, consequently, less energy will be wasted in its efforts to provide programmes for the clouds! After all, the clouds don't really want programmes!

The net result of this procedure is to provide a very strong signal for a distance of 50 miles or so, although this is only an approximation.

MUST BE HIGH

One big difficulty is that aerials of this nature tend to become expensive and difficult to erect, because if the wavelength of the station is a long one the aerials themselves must be very high to match. The one used by 2FC, for instance, is more than 700 feet!

However, many engineers consider the added strength they obtain in their "service area" is well worth the trouble, as, of course, a strong signal for the listener is the main aim of any transmitter.

A RADIO MAST NOT A MAST?

—When it's an aerial!

AERIAL AT 2GB

The aerial at 2GB is actually one-quarter of the wavelength of the station, which length, although not quite as pronounced in effect as would be a half-wave aerial, is, nevertheless, very efficient and is only half the height. As it is, this aerial towers 282 feet above the ground, is made of special galvanised steel, and weighs 12½ tons!

It must be insulated from the ground, so the whole weight is supported on a specially-made insulator which can withstand a pressure of 200,000 volts.

Four guy wires hold the mast in the air, connected 170 feet from the base. These wires alone total 1½ tons, are made in three sections, and the sag in the middle of each is equal to 3ft. 6in. So, you see, an aerial of this kind isn't exactly suited to erection in the back-yard!

The aerial is connected to the transmitter through a special cable of the concentric type, with an impedance of 100 ohms, for those who are interested. It allows an aerial current of about 4.7 amperes, and matches into the resistance of the aerial, which is 42 ohms.

Incidentally, the insulators which break up the guys are real man-sized affairs, and it takes a strong man to lift them from the ground.

The aerial itself, if it had no connection with the ground, would, of course, be in danger of collecting high static charges from the air, and as a result, might become highly electrified. So it is "earthed" through a special R.F. choke, which presents such a high impedance to the radio frequency fed from the transmitter that there is practically no leakage at all. At the same time, the choke allows any charges which the aerial might gather to be carried away to earth.

EARTHING SYSTEM

The earthing system for the transmitter is a veritable network of wires buried in the ground round about it. No chances can be taken where efficiency is concerned. As a result, 18 miles of wire are contained in 200 wires which lead away from the transmitter.

In order to make sure of a complete earth connection, the ends of these wires actually end up in the salt waters of the harbor, which surround the transmitter.

WHY MEADOWBANK?

The situation of the 2GB transmitting station may have been a source of wonder to many. Why plant a transmitter in such an unlikely looking hole?

The reason simply is that this position gives an excellent "take-off" for the radio waves leaving the aerial. The water and moist earth form the best possible type of country over which radio waves can travel, very little being lost by absorption, as would be expected from heavily-wooded or hilly country.

The situation was chosen first of all by making an aerial survey of Sydney and suburbs, in an endeavor to find a spot which had most promise. The fact that one must take a boat to travel to and from the station is only a minor matter. The 2GB engineers consider it well worth it.

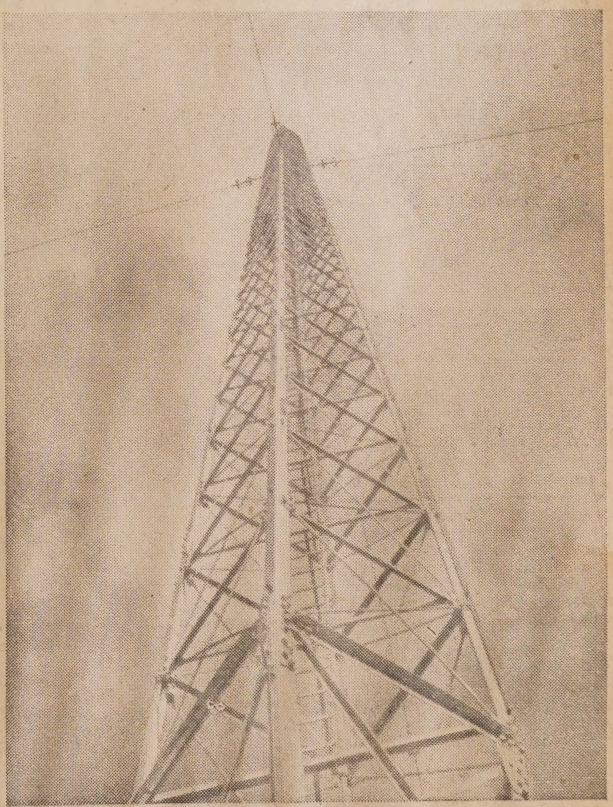
After selecting the likely-looking spot from the air, field strength tests were taken from a transmitter located on the spot, and the results indicated that what looked good, was, in fact, very good.

Other advantages of the location are found, for instance, in the fact that there are very few houses within the first half-mile or so of the station. Consequently, there are few people troubled with excessive signal strength, due to their close proximity to the aerial. Such signals would tend to blot out for these listeners programmes from other stations.

Furthermore, there is flat country round the transmitter for a distance of about 3 or 4 miles in almost every direction round the aerial mast. This is, as we have pointed out, a very favorable condition for good radiation.

In practice, all this theory is well demonstrated by the very strong signal radiated from 2GB almost anywhere in Sydney, and for some miles beyond. Even more than 100 miles from the aerial, despite the desire to cover the Metropolis first of all, 2GB can be received quite well even in daylight.

The aerial of 2GB from the base gives some idea of its construction.



Radio and Bushfires

HOW SIMPLE TRANSMITTERS CAN ASSIST FIGHTERS

Radio as an aid to fighting bushfires has not been made use of nearly as much as it might be. Where communication between various groups of men is so essential, in order to preserve the utmost efficiency, only radio can provide it, untrammelled by the need for wires etc. which make other methods impracticable.

A big field for the use of radio in fighting bushfires n Australia has been opened up by tests which have ast been conducted in Victoria with small, light, portble receiving and transmitting sets.

Experiments have for some time been made in arious parts of Australia with different types of sets, ut the Victorian tests are regarded as presaging a ew development in forest safety methods.

The aid of radio to fight bushfires is extensively nlisted in the United States, from which these new ets were imported, and a similar development seems ertain in Australia.

The use of radio has proved invaluable in the nited States, especially in areas where telephonic ommunication does not exist or is destroyed by the ames, and when aid must be summoned or instrucons given without loss of time.

Because the Victorian tests are of as much interest technical radio men as to fire-fighters, "Radio and Hobbies" has obtained first-hand information about hem for its readers.

VEIGH ONLY 15LB.

The sets can, because of their lightness, be carried n forest officers' backs. They weigh only 15lb., and re about 6in. by 6in. by 1ft. in size.

They are equipped with collapsible "fishing rod" erials and with strung wire aerials.

Their range is 26 miles for speech and 100 miles or Morse, the latter being used when secrecy is necesary.

The tests were made with hoses a mile long and umps, which were used against small "sample" bushres. Water was obtained from reservoirs and dams, nd instructions regarding water pressure required ere transmitted by radio from those at the ends of nd the strung wire aerials at the "pumps."

The "fishing rod" aerials are used in the forests, nd the strung wire aerials at the pumps."

A feature of the introduction of these new sets has een co-operation between forestry and radio officials, he sets having undergone tests by officials of the elbourne Technical College Radio School.

The Victorian scheme envisages the establishment a central radio station, with sub-stations in various istricts.

The training of forest officials in the use of the ts has already been begun.

ETS FOR N.S.W.

The sets will eventually be used in New South Vales, Mr. F. M. Bailey, divisional official of the Forestry Commission of New South Wales, told "Radio and Hobbies."

Experiments would probably be made with them in this State before long.

Receiving and transmitting sets of another type would shortly be installed in the administration office, look-out towers, and trucks in the Pilliga National Forest, Mr. Bailey said.

This would be the first time radio had been used in this State to fight bushfires.

Pick-a-back portable radio set used in bushfire work in Victoria.

The new portable fire pump for Victorian bushfire prevention work.

RECENT DISCOVERIES BY ARCHAEOLOGISTS INDICATE THAT ELECTRICITY WAS KNOWN AND USED TWO THOUSAND YEARS AGO.

BATTERIES 2000 YEARS AGO

Did they exist in 250 B.C.?

THERE is reason to believe that electric batteries were actually known and in use long before the time of Volta and Galvani. Those who built and used them at about the time of Christ—or even earlier—had, in all probability, no conception either of chemical reactions or of electric currents as we understand these terms. To them it was only an empirical knowledge; they could expect certain results when doing certain things.

MODERN CONSTRUCTION!

Dr. Wilhelm Koenig, of the Iraq Museum, in Bagdad, reported recently that a peculiar instrument was unearthed by an expedition of his museum in the summer of 1936. The find was made at Khujut Rabu'a, not far to the south-east of Bagdad, near the railway leading to Kirkuk.

It consisted of a vase made of clay, about 14 centimetres high and with its largest diameter 8 centimetres. The circular opening at the top of the vase had a diameter of 33 millimetres. Inside this vase a cylinder made of sheet copper of high purity was found—the cylinder being 10 centimetres high and having a diameter of about 26 millimetres.

The lower end of the copper cylinder was covered with a piece of sheet copper, the same thickness and quality as the cylinder itself. The inner surface of this round copper sheet—the one that formed the inner bottom of the hollow cylinder—was covered with a layer of asphalt, 3 millimetres thickness. A thick, heavy plug of the same material was forced into the upper end of the cylinder, as shown in the diagram.

The centre of the plug was formed by a solid piece of iron—now 75 millimetres long and originally a centimetre or so in diameter. The upper part of the iron rod shows that it was at first round, and, while the lower end has partly corroded away so that the rod is now pointed, it might be safely assumed that when it was first used it was of uniform thickness.

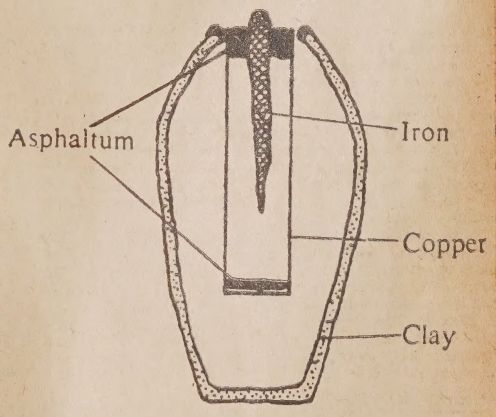
NO OTHER EXPLANATION

An assembly of this kind cannot very well have any other purpose than that of generating a weak electric current. If one remembers that it was found among undisturbed relics of the Parthian Kingdom—which existed from 250 B.C.-A.D. 224—one naturally feels very reluctant to accept such an explanation, but there seems to be no possible alternative.

The value of this discovery increases when one knows that four similar clay vases were found near Tel'Omar or Seleukia—three of them containing copper cylinders very similar to the one found at Khujut Rabu'a.

The Seleukia finds were, apparently, less well preserved—there are no iron rods in evidence any more. But close to those four vases pieces of thinner iron and copper rods were found, which might be assumed to have been used as conductive wires.

Similar "batteries" were also found in the vicinity of Bagdad in the ruins of a somewhat younger period. An expedition headed by Professor Dr. E. Kuhnel, who is now director of the Staatliches Museum, in Berlin, discovered very similar vases, with copper and iron parts, at Ktesiphon—not far from Bagdad. These finds date from the time when



Cross section of what appears to be a simple primary battery. It was unearthed at Bagdad in 1936.

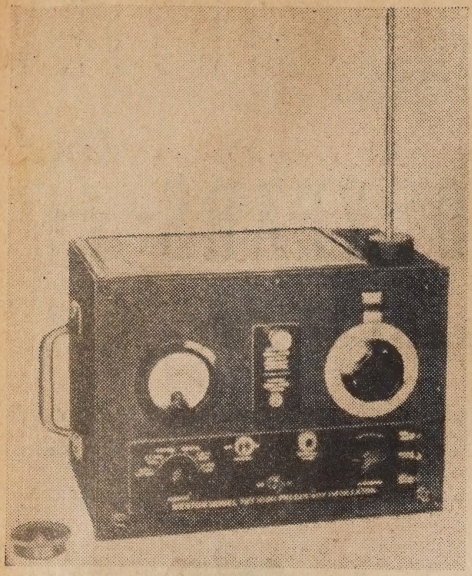
the dynasty of the Sassanides ruled Persian and the neighboring countries—A.D. 224-A.D. 651.

While the probable date of the invention is entirely open to conjecture, it seems likely that it was made in or near Bagdad, since all known finds were made in the vicinity of this city. It must be assumed, of course, that the subjects of the Sassanides had some use for them, and Dr. Koenig, the discoverer of the best preserved of all these vases, suggests that this use might still be in evidence in Bagdad itself.

He found that the silversmiths of Bagdad use a primitive method of electrogilding their wares. The origin of their method cannot be ascertained and seems to date back a number of years. Since galvanic batteries of the type found would generate a sufficiently powerful current for electrogilding small articles fashioned of silver, it might very well be that the origin of the method has to be sought in antiquity.

It is, of course, strange that nothing of this remarkable feat was related by ancient authors. But, if it is assumed that those batteries and their use was guarded as a trade secret, it is possible that it did not become known until now.

TECHNICAL



This Weston 787 U.H.F. oscillator is actually a miniature transmitter covering all television bands.

TELEVISION FORGES AHEAD IN U.S.A.

TELEVISION continues to forge ahead in the U.S.A. Practically every manufacturer of note has listed a number of television receivers for the new season.

In many ways, America affords a very interesting lesson in its method of the planned release of television. The awful grind upwards which we saw in England, from the early days when television was only a rough and ready experiment, is not for the Americans.

They are seeing television as it is, right up to the minute, all the lessons of England and the Continent learned, with a few angles of their own.

The wisdom of this idea is plain. Not until to-day has television been on such a basis that it could be paid for. In other words, the old style television was not good enough to be saleable, except as a novelty.

If the specifications of American equipment are correct, there should be little doubt that American television is of very high quality.

The latest American journals are filled with pictures and details of the new television sets, and it is interesting to note the various ways in which the screen of the vision tube has been mounted. Somehow none of them seem to be ideal, although it's hard to suggest any better way.

Illustrated here is a novel receiver, in which the cabinet proper can be swung at any angle, to suit the convenience of the "looker-in."

When placed with the screen downwards, naturally there is no danger of smashing the tube by some careless action, as these tubes cost good money. Other models include a variety of table and console types.

An appearance of special servicing equipment is also noticed, and advertisements are appearing for compact oscillators specially made for work on the ultra-short waves. The appearance of television sets is going to create an entirely new set of problems for the service man, and he must be equipped or he can scarcely hope to survive in business.

Although the design of a television receiver is not an easy matter, there are a number of firms in the U.S.A. which are placing on the market kits of parts for assembly by the amateur.

Naturally, only the advanced man would undertake the construction of such a set at present, but it can be taken almost as certain that time will see a simplification of design, just as was the case with radio. Television opens up a wonderful field for experiment by the enthusiastic amateur.

These may be obtained quite unassembled, or partly assembled, or in units. One firm which specialises in this class of business, namely Meissner, is particularly enterprising in this regard, and advertises regularly in all the well-known technical journals in the States.

A novel television receiver. The cabinet housing the tube revolves, so that the best viewing adjustment may easily be found. With the screen face downwards, no one can accidentally break the glass.

EDITOR'S WORLD REVIEW

Developments in other lands

FREQUENCY MODULATION

Major Armstrong's famous system of frequency modulation is important because it is the only system which appears likely to rival the present method of amplitude modulation.

MAJOR EDWIN H. ARMSTRONG, Professor of Electrical Engineering at Columbia University, held listeners spellbound as he described his system of frequency-modulated transmission and put it through its paces at Columbia's Pupin Hall (N.Y.C.) recently at a meeting of the Radio Club of America. Messrs. Weir, Fyler and Worcester descended from the Schenectady and Bridgeport offices of the General Electric Company to deliver companion articles on "F.M."

The demonstrations included relay transmissions so perfect it was impossible to determine, when a switch was manipulated, whether the pick-up was direct or relayed. The rippling sounds of a "liquid" being poured ("Radio *has* its limitations," the major "dryly" commented.) demonstrated the remarkable fidelity range of the transmission, which extended from below 30 cycles to above 18,000 cycles; "*A frequency range up to 18,000 cycles has been found desirable in some music transmissions,*" Major Armstrong said. Total harmonic distortion, up to 20,000 cycles, "is less than 1 per cent."

The experimental transmissions were made from station W2XAM at Alpine, N.J., on about 42.8 megacycles and 20 kw., and station 2AG in Yonkers, on about 110 megacycles (about 2.6 metres), and 1 kw.

The amazing carrying power of frequency-modulated transmissions was demonstrated by reducing the output energy from station 2AG to about 1 watt (by cutting-off final-stage power so that radiation was then only the "leakage" across this tube to the antenna), with only a slightly perceptible increase in the background-noise level.

It was further demonstrated that seemingly the only source of background noise at maximum receiver sensitivity and minimum signal input was the shot effect and thermal agitation in the 1st R.F. stage of the receiver.

Frequency-modulation transmission is now ahead of terminal equipment, stated Major Armstrong, who says that what is now wanted are high-level microphones.

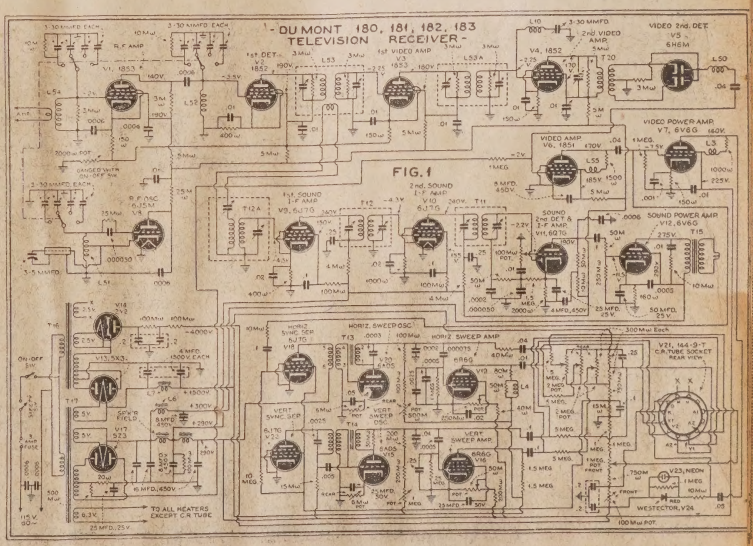
A furore was created when the ingenuity of a Columbia University man in the form of a *6-tube frequency modulation receiver* was demonstrated to have ample output to adequately fill the entire auditorium with sound from the special wide-frequency-range G.E. column loudspeakers that were set up on a balcony.

Another outstanding achievement brought to light at this meeting was the G.E. high-fidelity loudspeaker now standard in the new "F.M." receivers of the same make. A smoothly-graded range in the thickness of the loudspeaker diaphragm serves to maintain uniform compliance right out to the car-pinchoe edge of the cone. The result is a unit readily capable of handling over 9 W. with a frequency range of plus-minus 1 db., of 30 to 18,000 cycles!

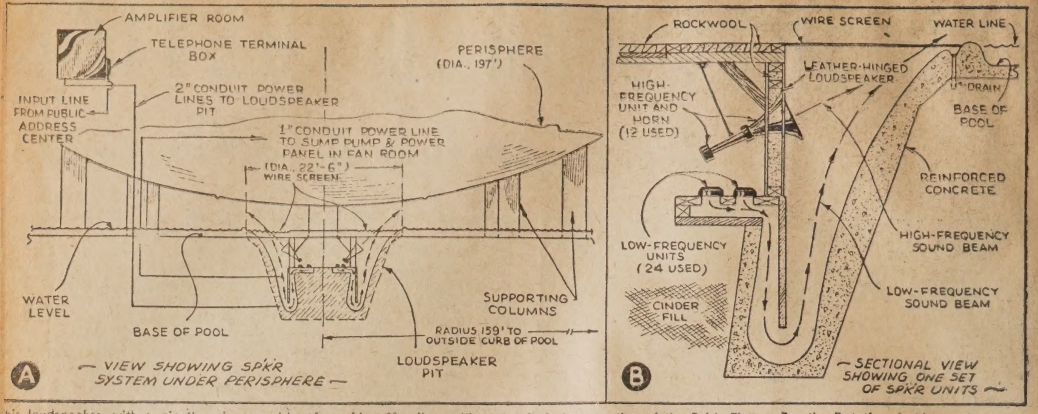
One of the advantages of the Major's system of transmission which is quite unlike the present type, is that the effects of interference by static, it is claimed, are almost eliminated. As far as we know, no commercial station in the world is using this method of transmission, as it means a complete departure from standard practice.

It seems certain, however, that any great advance over present standards of quality in transmission will be achieved by some method which is quite different in theory from the present system of amplitude modulation.

It should be stressed, however, that at the moment, the system is in the experimental stage, and there is no likelihood of it being adopted, for some time to come, if at all. As will be noticed, the transmitters mentioned all operate on the ultra-short waves, and a wide band-width is necessary to accommodate the carried of the station.



And in case you should think that television circuits are simple, get an eyeful of this baby! Only twenty-one valves are required in addition to the cathode-ray tube.



his loudspeaker, with a giant's voice capable of reaching 20 miles, utilizes the Perisphere portion of the Fair's Theme. For the first time in history, the outer surface of a building is being used as a gigantic exponential horn! (Illustration special to *Radio-Craft.*)

SPEAKER SYSTEM AT WORLD FAIR

The combination radio-public address system installed at the New York World's Fair is capable of simultaneous origination, monitoring, volume control and switching of 6 independent programmes with separate distribution to 4 public-address channels and 2 radio channels.

It is capable of either picking up electrical transcriptions radio programmes, or remote pick-ups, and transmitting ese programmes through its 4 studios to the 16 public-dress outlets located at strategic points throughout the ir's 1216½-acre site. The real centre of this vast system located in the Communications Building.

P.A. OUTLETS

Each of the 16 P.A. outlets scattered through the New rk World's Fair grounds embodies 2 specially-developed CA *cube* loudspeakers driven by four 50-W. amplifiers. The speakers measure 36ins. on each side and contain sep-ate low and high-frequency driving units, and an associated oss-over network having an input impedance of 15 ohms. th units are of the P.M. dynamic type.

Four specially-constructed studios are used at the New rk World's Fair for transmitting programmes either over e air or over wires to the various P.A. stations located roughout the Fair area.

Studio A, 32ft. long, 18½ft. wide, 15ft. high, is used for e orchestras and music presentations. Studio B, is a eaker studio and has been especially designed to appear a man's study, with easy chairs, desks, carpeting, books, .; it is 13ft. square with a 15ft. ceiling. Studios C and D e "Nemo" (remote control) studios, identical in size and ipment. They measure approximately 7 x 10ft. with t. ceilings. Recordings and piped-in programmes are trans-tted from here.

The output fidelity of the New York World's Fair sound ipment is of the highest quality obtainable. The fre-ency response from input to output of its amplifying equip-ment is within plus 2 db., from 30 to 10,000 cycles, without frequency compensation. Total harmonic amplitude distortion is less than 1 per cent. for any frequency between 50 and 7000 cycles; this is, truly, an outstanding achievement in acoustics.

BUILDING AS HORN

Perhaps the most spectacular aspect of the sound programme at the New York World's Fair lies in the fact that *for the first time in history the outer surface of a building is being used as a gigantic exponential horn.*

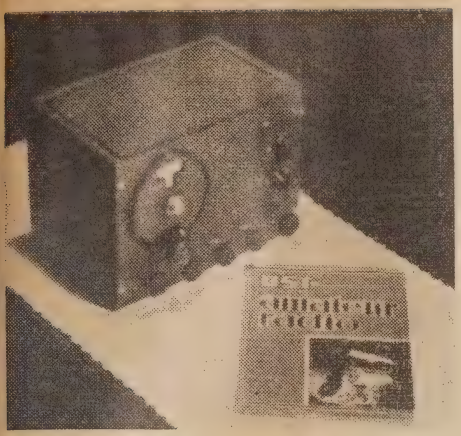
Music of extremely high fidelity issues from the mouth of a "horn" formed by the outer curving surface of the 200-ft. surface and the flat surface of a 320-ft. pool of water beneath the giant globe. This extra "horn" arrangement has an unprecedented sound coverage around a horizontal angle of 360 degrees. It is capable of producing 2½ bars of sound pressure at 20 cycles-per-second at the edge of the pool.

The largest and most powerful loudspeaker ever developed, the "perisphere horn" can produce sound audible 20 miles away—if permitted to operate at full power!

The diagram given on this page shows the location of the various high and low-frequency speakers, the acoustical pit, and the general arrangement of all components forming the "horn." The illusion produced by this method of sound distribution is that of sound originating in space without any apparent source. The response of the perisphere horn and sound system is flat over the frequency range from 20 to 8000 cycles.

The pyrotechnic display which takes place nightly over the Lagoon of Nations is really a symphony of smoke, fire, water, and light, the rhythmic motion of which is accompanied and enhanced by music and sound. The music and sound originate in a nearby auditorium, and are "piped" through wires to a special sound projector system. This system, second only to the perisphere horn in power, is installed in four circular structures located two on each side of the centre fountain ring.

Eight acoustic couplers, each consisting of a separate low-register or bass, and high-register or treble, element, comprise the huge sound projector. The audio spectrum is divided into two parts, the separation occurring about middle "C," and separate amplifiers are employed to drive the units of the two registers in order to provide reproduction undistinguishable from the original. The four bass couplers, combined, are equivalent to a horn with a mouth opening 30ft. square. This huge bass "horn" is actuated by eight 125-watt speaker units, each with a 24in. diameter diaphragm and 500lb. field magnet. The treble units are smaller, but handle an equivalent amount of electrical energy. The total energy required to drive the sound projector of this Lagoon of Nations is 2 kilowatts (2000 W.).



The QST-SIZE SUPER

Here is an interesting amateur short wave receiver design. It is rather remarkable for the fact that it is no larger than the pages of this famous Q.S.T. magazine—i.e.—9½ x 6½ inches.

The receiver is shown here in comparison with a copy of QST, which is the same size as the base of the set.

IN these days of more or less conventional design, it is interesting to see a short wave circuit which is a little out of the ordinary.

This receiver appeared in the June issue of QST and is particularly small in size. Of course, it need not be made as small as this, unless you are keen on saving space. Note that it doesn't include the power supply in the dimensions we have given.

The use of the 6J7 with separate oscillator may seem to be going back a long way, but these valves or equivalents are often to be found round the shack, and, if so, why buy others?

One of the interesting features is the use of the 6L7 as I.F. amplifier, in conjunction with a crystal filter.

Many Australian amateurs don't think the crystal filter is a worthwhile addition, and it may be omitted altogether if desired. Also a 6K7 type of valve may be used in place of the 6L7 with no change in results.

The use of the 6C8G as detector and beat oscillator is the same idea we have been using for some time, and works out exceptionally well.

COIL TABLE

Band	L_1	L_2	L_3	L_4	Bandspread Tap	Cathode Tap
3.5	7 turns No. 28	48 turns No. 22	6 turns No. 28	66 turns No. 22	60	18
7.0	6 turns No. 28	22 turns No. 22 spaced to 1" length	3 turns No. 28	14 turns No. 22 spaced to 1" length	10	5
14	5 turns No. 28	11 turns No. 22 spaced to 1" length	4 turns No. 28	7¼ turns spaced to 1⅜" length	7¼	2¾
28	7 turns No. 28	6¾ turns No. 18 spaced to 1⅜" length	10 turns No. 28	2½ turns No. 22 spaced to ⅜"	2¼	¾
56	5 turns No. 28	3 turns No. 22 spaced to 1" length	4¼ turns No. 28	1¾ turns No. 22 spaced to ⅜" length	1	¼

All coils closewound with enameled wire on 1¼" diameter forms unless otherwise stated. One-eighth inch spacing between L_1, L_2, and L_3. L_1 is wound at bottom of form, L_3 between L_1 and L_2

FIVE METERS

The claim that the set works well on five meters is interesting, but we doubt whether results would be as good as those obtained by a converter working into a standard receiver. This in case some may think it a good idea to build the set as a special 5-meter job.

We give the full coil details and circuit constants, as these will be of considerable interest.

There is no need to build the set on such a small chassis, unless space is at a premium. It should operate just as well in a larger space, and be much easier to construct. Also the power supply could be included. Standard power components would be suitable in conjunction with a 1500 ohms speaker field.

The coils are wound on 1¼-inch former," says the QST, "and full details are given in the table. All wound in the same direction. Each detector coil has its own grid lead and cap, to keep the grid leads as short as possible. Then only coils are likely to give trouble are those used on 5 meters, where the oscillator may refuse to work unless the coil makes good contact in the socket.

"The cathode and antenna winding of the mixer coil should be adjusted on each band so that the mixer goes into oscillation when the screen pentiometer is set about 45 volts. If serious trouble is encountered with images on the 7 or 14 mc. bands, loosening the antenna coupling will eliminate it. Images on 28 mc. will be combated by shifting the H.F. oscillator to the low frequency side of the band, or vice-versa, depending on which is most used.

"If the receiver is to be used only for phone operation, the B.F.O. portion of the 6C8G could be used as first audio amplifier."

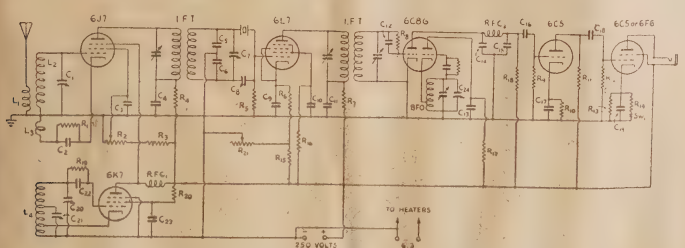


Fig. 1 — Wiring diagram of the six-tube superhet.

C_1 — 35-μμfd. variable (Cardwell ZR-35-AS).
C_2, C_4, C_{16}, C_{18}, C_{23} — 0.01-μfd., 600-volt paper.
C_3, C_5, C_{10}, C_{11}, C_{13} — 0.1-μfd., 500-volt paper.
C_6, C_8 — 50-μμfd. postage-stamp mica.
C_7 — 50-μμfd. midget variable (Cardwell ZR-50-AS).
C_9 — 15-μμfd. midget variable (Cardwell ZR-15-AS).
C_{12} — 250-μμfd. postage-stamp mica.
C_{14}, C_{15} — 0.001-μfd. midget mica.
C_{17} — 5-μfd. low-voltage electrolytic.
C_{19} — 10-μfd. low-voltage electrolytic.
C_{20} — 100-μμfd. midget variable (Cardwell ZU-100-AS).
C_{21} — 35-μμfd. midget variable (Bud).
C_{22} — 100-μμfd. postage-stamp mica.
C_{24} — 20-μμfd. midget variable.
R_1 — 2000 ohms, ½-watt.
R_2 — 75,000-ohm volume control.
R_3, R_{13} — 50,000 ohms, 1-watt.
R_4, R_7 — 1000 ohms, ½-watt.
R_5, R_9, R_{12} — 500,000 ohms, ½-watt.
R_6 — 200 ohms, ½-watt.
R_8 — 1.5 megohm, ½-watt.
R_{10} — 2500 ohms, ½-watt.
R_{11}, R_{18} — 250,000 ohms, ½-watt.
R_{13} — 2500 ohms, 1-watt.
R_{14} — 500 ohms, 5-watt, wire-wound.
R_{16}, R_{17}, R_{19}, R_{20} — 50,000 ohms, ½-watt.
R_{21} — 10,000-ohm volume control.
I.F.T. — 500-kc. air-tuned i.f. transformers.
B.F.O. — 500-kc. beat-frequency-oscillator assembly.
Sw_1 — S.p.s.t. toggle switch.
RFC_1 — 2.5-mh. r.f. choke (Coto-Coil).
RFC_2 — Broadcast type r.f. choke, 85 mh.

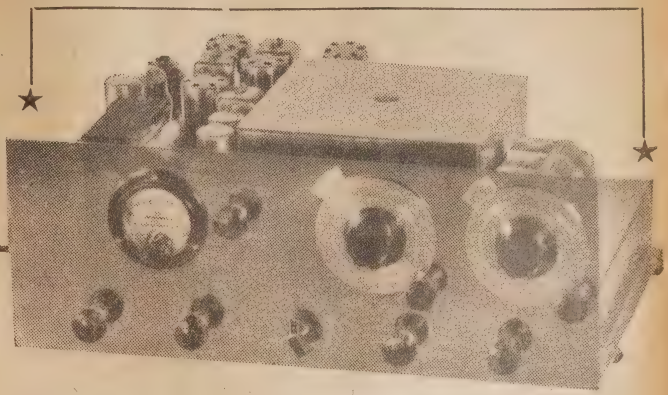
Here is the circuit complete with all values of components.

Australian-made

COMMUNICATIONS RECEIVER

RELIANCE SKY-RAIDER

Here is something new for the short-wave listener—a commercially built set with many excellent features.



This view shows the two tuning dials, each with vernier adjustment, the signal strength meter, and other controls.

THE announcement by Reliance Radio that they are launching out into the field of special Communication type short-wave receivers is an indication of the growing interest in this type of set in Australia.

Up to the present time the only way one could obtain such a receiver was either to build it oneself or to have it built by a radio mechanic.

The man who builds his own receiver will probably continue always to do so, but the man who has to have his sets built for him will find the finished article a much more attractive proposition.

Not only can he see just what he is buying before putting down his money, but he has the knowledge that the makers of the set, having specialised in its particular type, are able to assure him of a satisfactory standard of workmanship.

THE SKYRAIDER

The circuit of the Skyraider receiver shows that in essentials it follows the best accepted practice of such receivers of the present time. Apparently nothing has been omitted in the way of decoupling, &c., which would prejudice performance. As a result, we found th set under test to be exceptionally smoot in its operation, very stable even "fu out," and possessing a really low noi level.

A very good feature is the use of a R meter which reads forwards on th scale. This is done by a 6B7S as th beat frequency oscillator, and also as rectifier working from the second in termediate stage. It is therefore quick acting and a very handy thing to hav

PLUG-IN COILS

Plug-in coils are used in the set, b the oscillator is padded, so that eve tracking is obtainable over the who of each band. Thus there are no trim mers for adjustment on the front pan —quite a good feature for the man wh is more or less a layman.

BAND-SPREAD

Two tuning dials are provided— band-set condenser which has a ver wide coverage for each set of coils, conjunction with three ganged trolito type midgets to spread out any sectio of any band for easy tuning. This an excellent feature, and, in our opinio the best way to go about it with such receiver.

The total wave-range of the set 9-120 metres with three sets of coils.

The finish of the chassis is in hea chrome plate, and its appearance is mo handsome and workmanlike.

This rear view gives an idea of rugged construction. The band-setting broadcast-type gang is on the extreme left.

These cakes wouldn't rise if there were no CO2 to make them light.

The FIZZ in your DRINK

A fascinating article on carbon dioxide, one of our most essential and interesting gases. You can't do without it in cooking, lemonade, honeycomb toffee, or Seidlitz powders.

By CALVIN WALTERS

EVERY time I blow the froth off my pint of beer, I think of the enormous profits that are made possible by the existence of the gas known Carbon Dioxide, or, as the chemists ll it, CO2. I often think that Prohibitionists are barking up the wrong ee when they blame the brewers and er-drinkers for the evils of drink. ather should they try and sheet home ie blame to the inventor or discoverer Carbon Dioxide.

OING TECHNICAL

For it is a safe bet that if our beer d not contain this active gas, none of would drink it. It would be as flat a pancake.

That gives me an idea. Next time I ant to complain about it, I will say: have to report that the quart flagon purchased here, on Saturday showed a arked deficiency in its Carbon Dioxide ntent." That should make 'em sit up.

Even a teetotaller won't drink flat monade, or a prohibitionist either, so here would they be without Carbon ioxide? Tell me that!

I suppose I had better explain this itburst, and get down to business. hat is Carbon Dioxide? From now on am going to call it CO2. It is easier write.

SSENTIAL TO LIFE

CO2 is one of the most widely disibuted of gases. Strange to say, if it d not exist, we human beings could ot exist either. On the other hand, if exists in too great a quantity, we still uld not exist. A chappie named Joseph lack first noticed it in 1757. He was essing around with some marble, and found that if he heated the marble a gas was given off. Incidentally it was Black who discovered that it was CO2 that was given off when sugar was fermented. Now get to it, you prohibitionists.

When we take a breath, we fill our lungs with air which contains about 21 per cent. of oxygen. This oxygen is absorbed into our system and about eight per cent. of it is removed only to be replaced by a small percentage of CO2. We, of course, breathe this out, and it is distributed into the surrounding air.

If you are in a room that is insufficiently ventilated, you have noticed that the room becomes what we call stuffy. If you are playing cards, you start to lose money because your brain becomes dull and you can't concentrate.

A BORING BUSINESS

If you are at a meeting you start to yawn, and the lecturer thinks you are bored. This is the result of too much CO2 in the air. The fresh air has been used up, and the CO2 breathed out is continually polluting the air of the room until it becomes what we term stuffy or oppressive.

Exactly the same thing happened to those poor fellows in the submarine that was sunk the other day. Unless the air contains over 10 per cent. of oxygen it will not sustain life, and in the case of a submarine, completely immersed and without means of replenishing the oxygen, the air gradually becomes polluted and the CO2 content becomes greater, with the consequence that the crew suffocates.

Now, pure air contains about 3 parts in 10,000 of CO2. And as plants and trees require an abundant supply of absorbable carbon in order to live and grow, they are furnished with leaves. On the lower surface of the leaves are minute openings called stomata. These openings take in the CO2 from the air, and as the CO2 contains carbon one part and oxygen two parts, the green coloring-matter of the leaves, which is called chlorophyll, acts upon the CO2, absorbing the carbon and liberating the oxygen, which is released again into the atmosphere. What a marvellous thing this is!

"DRY ICE"

CO2 has many other sources. It is generated during the decay of vegetable and animal matter. The carbon in the matter is converted chiefly by bacteria into CO2. It is formed by the combustion of wood, coal, and coke. In fact, this latter fact is made use of in the manufacture of "dry ice." The CO2 is blown out of the furnace, where it accumulates, and, after being purified in various ways, it is compressed, liquefied and solidified into pure solid carbon dioxide.

CO2 also issues from the ground in various regions, being formed by volcanic action. In various parts of the world there are natural springs, the waters of which are effervescent. This effervescence is caused by the water being saturated with CO2. The well-known Vichy water and other spa waters are good examples of such.

Water will absorb about its own volume of carbon dioxide. This is how

lemonade and other gassy drinks are made. The water is flavored with lemon and sugar, and an acid—usually citric acid— and the CO_2 forced through it under pressure. The cap is put on the bottle while under pressure, and when the cap is removed, the gas begins to rise from the water, causing it to bubble.

The CO_2 in beer and sparkling wines and cider is caused by bacterial action through the fermentation by yeast.

All this CO_2 that is continually being formed about the place would in time suffocate us if it was not continually being used up by trees and plants. So bear this in mind next time you may have a tendency to chop down a tree.

There is an important property of carbon dioxide which is made use of in those innocent looking hand fire extinguishers that hang on the walls of buildings. These things are a veritable source of surprising energy.

HEAVIER THAN AIR

The property I refer to is this. CO_2 is heavier than air. Also flame cannot exist without a supply of oxygen. The fire extinguisher is so made that it contains a solution of soda. Now, if any acid is poured into soda, carbon dioxide is generated violently in the solution. So a little bottle of acid is supported inside the extinguisher. When the gadget is tipped upside down the acid spills into the soda solution and CO_2 is generated.

Some of the gas fills the space between the liquid and the top of the barrel, and the pressure formed forces the liquid out of the nozzle. At the same time the gas in the solution sprayed on the fire helps to prevent oxygen reaching the flames and the water and gas combined forms a very effective method of fighting the flames.

COOKING CAKES

Carbon dioxide is the cause of the sponge in sponge cakes, &c. Let her who reads take consolation that your husband's indigestion was perhaps not caused by your cooking, but by the lack of CO_2 in same. Those lovely cakes that his mother used to make were no better than yours. They simply had more CO_2 than yours. How then to get this CO_2. From the proper proportions of cream of tartar, soda, and water. This is what happens. Cream of tartar is acid.

And, remembering the fire extinguisher above, acid and soda generate carbon dioxide. So you put cream of tartar soda and flour together and when the water or milk is added CO_2 is formed, causing the flour mixture to become full of bubbles. It begins to rise and you put it in the oven.

The action of the heat causes the flour mixture to harden, so retaining its spongy texture.

If you open the door of the oven before the mixture is properly hard the cold air causes the gas to contract and the business sinks and your husband gets indigestion. Then he runs for the baking soda, because he has an acid stomach. The soda mixing with the acid in his stomach releases carbon dioxide in his tummy, and so here we are again—back to CO_2. You can't get away from the stuff.

Then we have that sticky mess we used to eat as kids—honeycomb toffee. This is made as follows:—You make a toffee, any kind of stuff, and put a little vinegar into it. Vinegar is an acid. After the mixture is properly cooked it is cooled down a little and a small amount of baking soda added.

This combines with the acid vinegar and causes CO_2 to be released in the same way as the sponge cake. The stuff rises all over the place and sets in the same condition, and there is your honeycomb toffee. Mind you, I am not taking any responsibility for results if you start out on these lines. Don't start writing to me for recipes. Please refer to the cookery editor. (If any.—Ed.).

SEIDLITZ POWDERS

All those effervescing fruit salines and granular salts, Seidlitz powders, depend for their effervescence on carbon dioxide. They contain usually an acid such as cream of tartar, tartaric acid, or citric acid, and baking soda, which is sodium bicarbonate.

When water is added the acid and soda combine and generate the CO_2. The idea is mainly to disguise the flavor of the other ingredients, such as Epsom or Glaubers salts and other unpalatable substances, and although these effervescing powders are effective they are certainly not recommended as a beverage.

So you see that, whether you drink beer or lemonade, whether you are a cook or a fireman, or a botanist, you must have your carbon dioxide. But you must have it correctly. It can make you sparkle if you drink it. It can make you sleep temporarily or permanently if you breathe it. It is the salvation or downfall of the cook and confectioner and the saviour of the dyspeptic. The enemy of the incendiarist and the friend of the brewer. Without it there would be no beer, therefore no froth blowers' anthem, no drinking songs, no prohibitionists, no lemonades, no sponge cakes, no trees or plants. Dead matter may be always with us. In fact, WE wouldn't be here, which is a paradox, so I will go no further.

A Good Head To It!

This man doesn't know it, but the "head" on his drink is due to carbon dioxide.

An elementary

COURSE IN RADIO

for beginners

Being a very elementary course of Radio study for those who wish to know "what makes the wheels go round."

By L. B. GRAHAM, Principal of the Australian Radio College, Pty.,

RADIATION AND RECEPTION

THE last article finished with a brief explanation of the process of modulation. The modulated carrier wave is usually amplified the transmitter and fed from the final wer stage through some coupling vice into the aerial circuit, where it is diated into space.

It is not proposed to discuss in detail e various theories which have been vanced in relation to the propaga- on of radio waves, but to give an ex- anation of their action which can be dily understood.

An aerial such as that used in trans- ission and reception possesses two ctrical characteristics apart from its sistance. These are capacity and ductance. That is, the aerial has the operties of both a coil and a con- nser. Referring back to the second ticle, we find that a condenser con- sts of two plates of conducting material parated by a dielectric which is an sulator. When a voltage difference is plied across the plates electrostatic es of force are set up in the dielectric aterial.

ERIAL CAPACITY

Fig. 1 shows how the aerial possesses this condenser effect. The vertical section of the aerial is insulated from earth and will form one plate of the condenser. The earth will form the second plate. The dielectric is provided by the air between the two plates and also by the insulator which insulates the aerial from earth.

If a voltage difference is applied across these two plates a field of electrostatic lines of force is set up as shown in Fig. 1B. This field, which is vertical to the earth's surface, will completely surround the aerial.

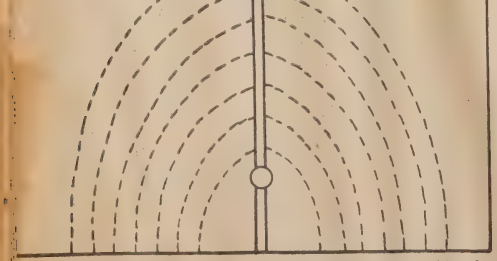
Before a voltage difference can exist across the plates of a condenser, the condenser must be charged, and to charge the aerial a current must flow. This flow of current, in the aerial illustrated, will pass along the vertical conductor until the condenser is fully charged. It will then cease flowing. The passage of current through a conductor causes electromagnetic lines of force to rise out of that conductor, exactly as explained when referring to a coil. These electromagnetic lines of force will completely surround the aerial, but will be parallel to the earth's surface, instead of vertical, as in the electrostatic lines of force. This is shown in Fig. 2.

ALTERNATING CURRENTS

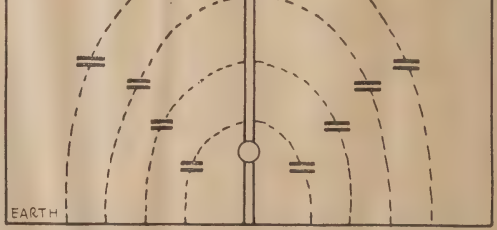
When the voltage and current supplied to the aerial and earth are alternating, or changing their direction, the two fields will rise and fall or change direction in accordance with the supply.

If the supply is alternating rapidly the fields do not have sufficient time to fall back into the aerial before the next alternation comes along. They are, in effect, pushed out into space and radiated in all directions (except in the case of directional aerials). The more rapidly these alternations take place or the higher the frequency, the greater will be the radiation. This is one reason why stations of low power but high frequency can cover such great distances.

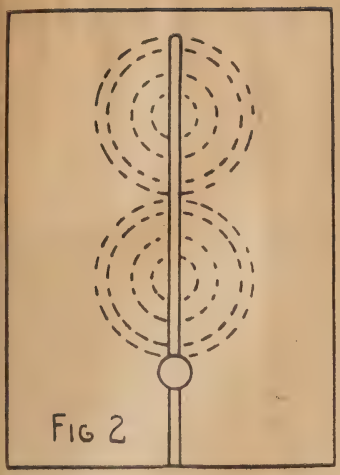
As previously mentioned, the passage of lines of force through a conductor causes a voltage to be generated in that conductor. If then, a metal wire is erected in the path of these radiations it will have a voltage generated in it which will vary in exact accordance with the variations affecting the transmitter's aerial. To make use of this voltage the aerial is built to form a condenser, the aerial being one plate and the earth the other plate, the two

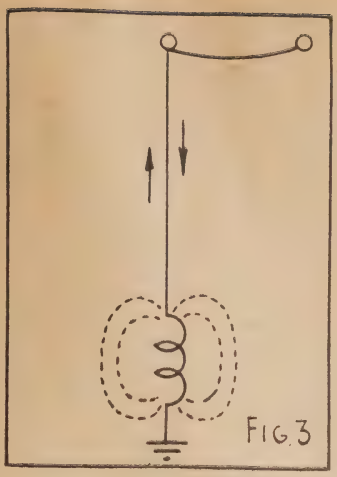


strating the lines of force in the electrostatic field of the aerial.



Showing how the aerial has a capacity effect to ground.





plates are connected together through a small coil as shown in Fig. 3.

LEAD-IN CURRENT

The voltage, generated in the aerial, causes a current to flow down through the lead-in wire, through the coil to earth. Then when the field reverses, current will flow in the reverse direction, that is, from earth up through the coil to the aerial.

The varying current flow through the coil causes a rising and falling of magnetic lines of force about the coil. If a second coil is placed close to the first one these rising and falling lines of force will produce voltage in its turns. Some of the energy, which was originally radiated from the broadcasting station, will be transferred by reason of electromagnetic coupling to the second coil. Presuming that there is only one station on the air we could then separate the modulation from the carrier wave by means of a "detector" and "listen-in" to the station.

Fig. 2.—Electromagnetic lines of force resulting from passage of current through the aerial.

Fig. 3.—Voltage generated in the aerial producing a changing current through the coil resulting in rising and falling lines of force around the coil.

Fig. 4.—Fundamental circuit of a crystal set.

Fig. 5A.—A modulated carrier wave. Fig 5B.—Modulated carrier after rectification. The dotted line shows audio variations of amplitude.

TUNING

There is a vast number of stations o the air which are capable of producin voltage in the aerial circuit. All these would be heard to a greater c lesser degree. It is necessary then t separate them. The process of doin so is commonly termed "tuning."

To select one signal in preference t all others, the undesired ones must b weakened as much as possible and th desired one allowed to pass through th circuit with the least possible opposi tion. To produce this desirable stat an oscillatory circuit, consisting of coil and tuning condenser, as explaine in article two, is generally used. was mentioned that a coil and condense of exactly similar reactance, whe placed together, cancelled each other reactances, leaving only the resistanc of the parts to oppose the flow of cur rent. In tuning a desired station, th reactances of coil and condenser ar made to equal each other at that sta

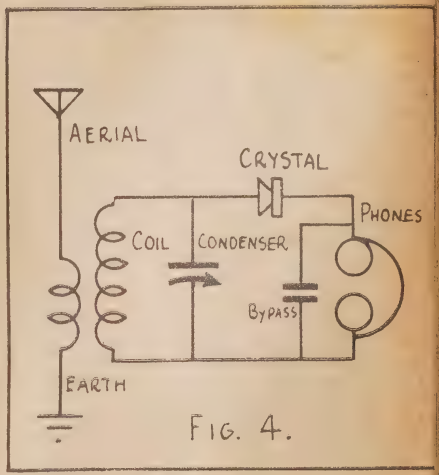


FIG. 4.

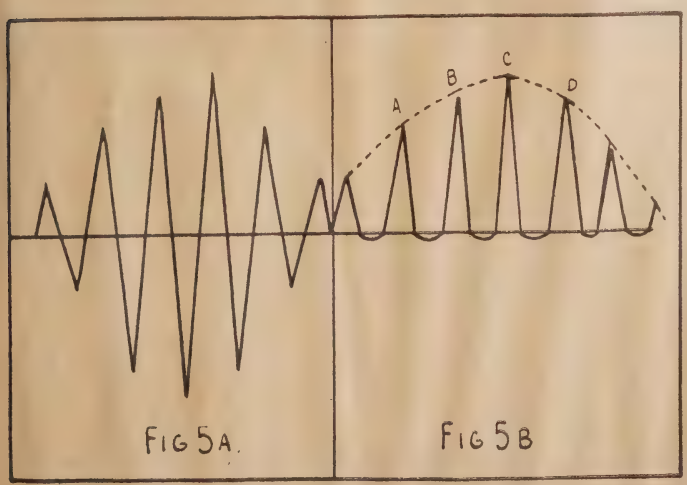


FIG 5A. FIG 5B

tion's frequency. The reactances wi then cancel, leaving only the circuit resistance to oppose the flow of curren The coil and condenser are then said t be in resonance at that frequency. Othe frequencies do not produce this comple cancellation of reactance, and meet great deal more opposition than do the desired frequency. They are co sequently weak compared with t station we want to hear.

Resonance at any desired frequenc may be obtained by varying either t electrical size of the condenser or t coil.

More will be said about coil and co denser action and reactance in lat articles.

Having tuned the station, it is nece sary to obtain the audio frequency fro the modulated carrier wave. To ma this possible, some type of "detecto must be used.

The simplest form of detector is t crystal type, the symbol for which

(Continued on Page 75)

About

SELECTIVITY

Its influence on tone quality

PART 2

Selectivity is more than the ability to separate stations. Its effect on the tone of a receiver is very marked, and coil design must take this into consideration. Our contributor follows his article of last month with a discussion of selectivity in relation to tone quality.

IN last month's issue the method of determining receiver selectivity was described. This month its effect on performance will be gone into in more detail, and a number of points outlined, which may assist the designer to interpret the curves obtained.

At the close of the previous article reference was made to the impairment of the tonal qualities of the receiver, which result when the selectivity is carried beyond a certain degree, due to attenuation of the higher modulation frequencies contained in the side bands of the transmission.

Audible sound comprises vibrations, the pitch or frequency of which may vary from twenty to twenty-thousand times per second, and is usually of a most complex wave form, the amplitude or loudness of which varies by as much as 8D DB or a ratio of 10,000,000 to 1.

ELECTRICITY TO SOUND

In radio transmission these sound vibrations are converted by the microphone into alternating electric currents, and after transmission and reception are re-converted to sound vibrations by the loud speaker at the receiver.

If the reproduction is to sound exactly the same as the original, it is obvious that the vibrations from the speaker must preserve the same relationship, both as to frequency and amplitude, as those reaching the microphone at the transmitting end.

When one stops to consider the number of individual components forming the link between the original source of sound and the ear of the listener, it is remarkable that these vibrations can be reproduced so realistically.

The modulation frequencies impressed on the carrier wave of the transmitter take the forms of side bands, which appear on both sides of the carrier frequency, and if the selectivity of the receiver is such that the output falls off when the signal is detuned from resonance by an amount equal to the impressed modulation frequency, then the modulation frequency will be attenuated and the reproduction will not be identical with the original sound.

DIFFICULT FREQUENCIES

The most difficult frequencies to reproduce faithfully are those lying below 100 cycles and above 5000 cycles per second, all of which are vitally necessary to obtain realism in reproduction.

Those lying below 100 cycles per second are primarily affected by the audio frequency system, and the loud speaker, and are not influenced by the selectivity of the receiver. While it is comparatively easy to obtain faithful reproduction of the higher frequencies in the audio frequency portion of the receiver, it is extremely difficult to do this when the selectivity of the receiver is adequate to separate stations operating on the present spacing of channels.

In fact, where two stations are operating with a frequency difference of 10 kilocycles and of approximately equal signal strength, it is impossible to reproduce frequencies above 5000 cycles without inter-action occurring between the two. Even if the stations were separated by as much as 20 kilocycles, the side of the selectivity curve would have to be vertical in order to overcome this form of interference.

MONKEY CHATTER

Interference between the side bands of two stations, when modulation is present on both, takes the form known as "monkey chatter," while, if the receiver is capable of faithful reproduction of frequencies up to 10,000 cycles, the high pitched heterodyne whistle of this frequency will be audible at all times.

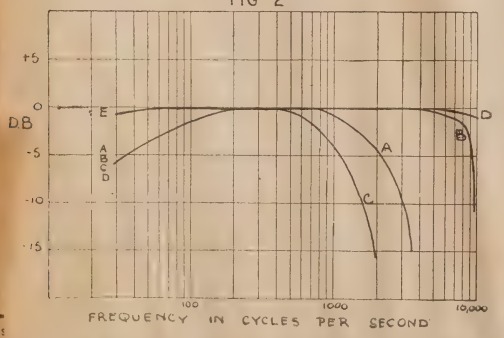
A few years ago in America a number of manufacturers developed what were then called high fidelity receivers, which were capable of excellent reproduction of all audible frequencies. These were not a success, due to the trouble encountered with interference between stations. This brought about the introduction of a number of stations operating on ultra-high frequencies where the spectrum was not so crowded. However, recent developments, such as television, have now encroached on these frequencies, and it seems likely that they will also be forced to discontinue.

To illustrate the effect of receiver selectivity on the fidelity of the reproduction, we illustrate in Figure 1 two selectivity curves, and in Figure 2 the fidelity obtained in each case.

In Figure 1A it will be seen that at 4 kilocycles from resonance it is necessary to increase the input to the receiver by ten times to obtain constant output, while in Figure 1B this is obtained for as much as 8 kilocycles either side of resonance.

The effect of this is fairly obvious in Figure 2; in the case of curve A we see that the audio frequency output is over 10 decibels down at 3000 cycles, and beyond this there is very little output at

FIG 2



This graph shows the degrees of fidelity obtained with the three different intermediates as illustrated in Fig. 1 on the next page. Note how the high notes are attenuated with the very selective coils.

FIG 1

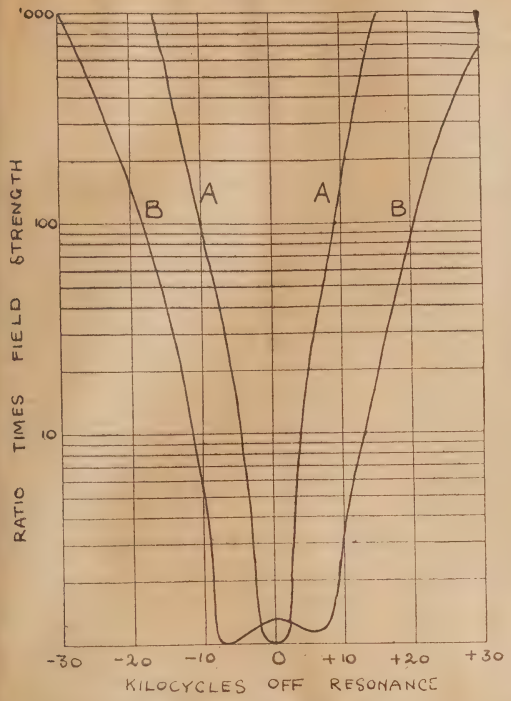
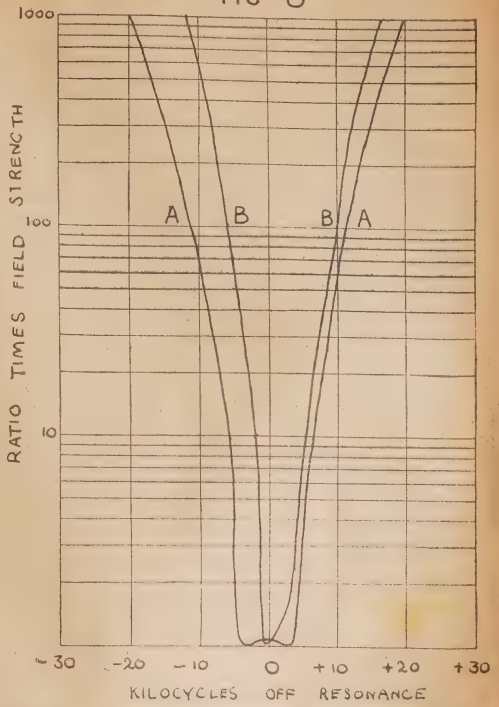


FIG 3



all, while at B the output is constant to over 6000 cycles, and is only 5 decibels down at 9000.

The fidelity of the audio frequency amplifier is the same in each case, and in Figure 2C we show the curve obtained when the tone control of the receiver is turned to the deep position. Strangely enough, this is where the vast majority of listeners seem to prefer it.

In Figure 2D the response of the audio frequency amplifier alone is shown, while at Figure 2E a marked improvement in low frequency response will be seen, as the result of attention to the values of the components in this part of the circuit.

IN SUPERHETERODYNES

In a superheterodyne receiver the selectivity is contributed mostly by the intermediate frequency amplifier, and it is in the design of the transformers used in this part of the circuit that determine the overall fidelity of the finished receiver.

The usual type of intermediate frequency transformer generally consists of two coils, tuned by means of condensers, and the coupling between the coils is usually adjusted to give the optimum gain and selectivity. If the coupling between the coils is increased beyond a certain point the nose of the selectivity curve starts to broaden out and eventually two separate and distinct resonant points will be found, and if the coils have low losses a trough will appear between these resonant points, as can be noticed in Figure 1B. If carried too far this not only tends to accentuate the higher modulation frequencies, but causes a serious form of distortion at the detector valve, which is greatly accentuated when the carrier is deeply modulated.

OVER COUPLING AND ALIGNMENT

The alignment of an intermediate frequency amplifier having transformers

BY
E. M. FANKER
Chief Engineer Thom & Smith Pty. Ltd.

purposely over-coupled, is not a simple matter of tuning each coil for a maximum output. If this is done a curve, similar to Figure 3A, may be obtained, and if any reaction is present in the amplifier serious instability may result.

It is generally considered necessary to align an amplifier of this type by means of a frequency modulated oscillator, together with a cathode ray oscillagraph. But for those who are not so fortunate as to possess this equipment it may be carried out fairly simply as follows:—The receiver, signal generator, and output meter should be set up as previously described for taking the selectivity curve.

RECEIVER ADJUSTMENTS

Signal generator should be set at the desired mean intermediate frequency and a 10,000 ohm carbon resistor should be temporarily connected across all coils in the intermediate amplifier, exceptin the last one. Control signal should b fed to the receiver from the signal generator, and this coil adjusted to giv maximum reading on the output meter

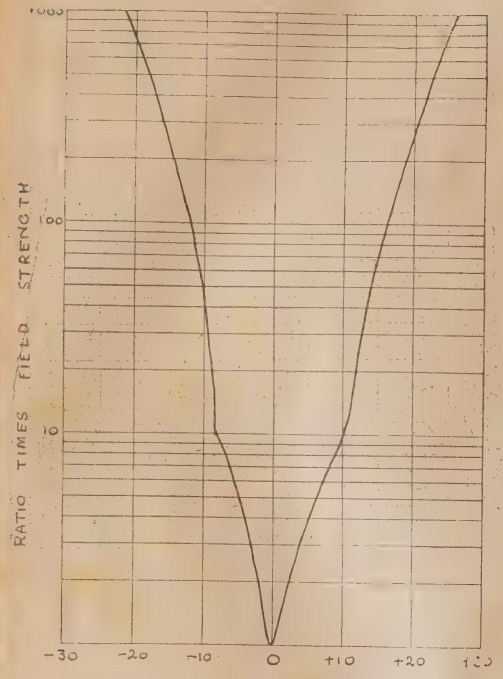
The 10,000 ohm resistor on the primary of the last transformer should the be moved to the secondary that has jus been aligned, and the primary adjuste for maximum output. The resisto should then be removed from the sec ondary of the preceding transforme and placed across the primary that ha just been aligned, and the process re peated. Finally, with resistors acros all the other coils, the primary of th first transformer should be adjusted No further adjustments on any of th transformers should be made.

If the receiver is reasonably fre from reaction the amplifier should no be properly lined up, and the selectivit curve should be symmetrical. The re sult of going over the circuits agai and lining each one to the maximu output is shown in Figure 3A, while th curves obtained after proper adjustmen is shown in Figure 3B.

CHECKING FOR REACTION

The presence of reaction in an inter mediate amplifier may usually be de

FIG 4



This graph shows how regeneration affects the selecting curve of the receiver. Note the extreme sharp "nose" while the skirt remains approximately the same as before.

fected by a study of the selectivity curve. In early receivers deliberate use was made of reaction in order to improve the sensitivity and selectivity of the receiver. But results obtained from its use were so inconsistent that most elaborate precautions are now taken by receiver designers to eliminate it from their circuit, at the same time retaining the performance by the use of improved coils and components having lower losses.

Figure 4 shows the selectivity curve of a receiver in which considerable reaction is present. It will be noticed that while the nose of the curve is almost knife edged, the skirt is quite broad. This is a definite indication of reaction in the circuit, and it is obvious that whilst such a receiver would separate weak signals quite adequately, it would be quite impossible to separate a weak station from a strong local one. Particularly as the presence of the strong local signal would generate sufficient volume control voltage to reduce the sensitivity of the receiver, and render the reaction inoperative.

One common source of reaction in an intermediate amplifier is in the common high tension supply lead to the frequency changer and intermediate frequency amplifier valve. This should always be by-passed by a paper condenser in addition to the usual electrolytic used at this point.

CATHODE COUPLING

A more serious, though often overlooked, source of this trouble lies in the use of a common cathode resistor for these two valves; if this is used it is essential that it be by-passed with a condenser of not less than .5 microfarad capacity. Modern practice is to ground the cathodes on both these valves, and obtain the minimum bias by returning the automatic volume control network to a resistor in circuit in the negative side of the power supply.

If a receiver, having a selectivity curve similar to that shown in Figure 4 were to be used for short-wave reception, it would be particularly prone to a form of motor-boating, which occurs when a strong carrier is tuned in, and the volume control is advanced. The cause of this trouble lies in common coupling in the power supply circuit, and is even present to some extent with battery receivers. What happens in effect may be explained briefly as follows:—

When a strong signal is tuned in it passes through the various stages of the receiver, and finally comes to the grid of the power valve. This causes a change in the plate current of the power valve, which is reflected back to the power supply to the oscillator portion of the frequency changer.

If the response of the amplifier is similar to that shown in Figure 4, the slight detuning caused will result in a considerable falling off in output, which causes the plate current of the output valve to again change. This change is in turn reflected back to the frequency changer valve, and the receiver motorboats at a frequency determined by the constance of the filter circuit in the power supply. A receiver having a curve similar to that shown in Figure 1B, would be almost entirely free from this trouble, and even if the power supply had extremely poor regulation, very simple decoupling at the frequency changer valve would be sufficient to entirely eliminate it.

It is doubtful, however, even with extremely stable frequency change of valves, such as the 6K8G, etc., if this trouble could be entirely overcome should the receiver have a curve similar to that shown in Figure 3B or Figure 4.

INTERMEDIATE DESIGN

In designing an intermediate amplifier there are three factors to consider; first, maximum gain; second, a broad nose on the selectivity curve; and last, but not least, as narrow as possible a skirt to the curve.

The gain of the stage can usually be regulated by varying the ratio of inductance to capacity in the tuned circuits, but a compromise must be effected here as any increase in the L/C ratio has an adverse effect on the selectivity.

Unfortunately, attempts to broaden the nose of the curve by over-coupling the coils almost invariably results in a broadening of the skirt of the curve, and to keep this to a minimum it is necessary to utilise coils in the tuned circuit having extremely high Q values. Q values of the order of 300 are readily obtainable by the use of high frequency iron cores and multi-strand litz wire, but values beyond this become impractical, and if better performance is desired than can be obtained from one stage it may be necessary to utilise two stages of intermediate frequency amplification.

Transformers designed for optimum performance in single stage amplifiers should definitely not be used in circuits using more than one stage, as the additional amplification obtained will almost certainly result in instability and oscillation.

USING TWO STAGES

If it is desired to use a two stage amplifier transformers having coils of moderate Q value should be used, and the stage gain reduced by removing turns from the coils and connecting high quality fixed mica condensers in parallel with the trimmers in order to re-tune the circuit to resonance.

Values as high as .0005 mfd. or even .001 mfd., are not too high, and the coupling of the coils should be increased until the nose of selectivity curve broadens by the desired amount. Alignment of the circuit may be effected by the method previously described.

If the last transformer feeds a diode detector it is desirable to make the coupling considerably closer than normal, as this transformer actually has to deliver power to the diode and considerable distortion of the positive half of the modulation envelope may take place if the coupling is made too loose at this point.

PORTABLE RECEIVER'S SUCCESS

Rarely has a receiver met with such instant approval as the H. and R. portable set, which was described in last month's RADIO AND HOBBIES.

As soon as the paper was on the streets, we began to receive inquiries from our readers, and from the trade, concerning the set. It was quite obvious that we had succeeded in providing something which was badly wanted.

The original receiver is still going strong, and has been sought after by quite a number of people who were prepared to pay out spot cash for it as a going concern! It has been a constant companion in the home, out-of-doors, and in the car, and we have learned to rely on it in all circumstances.

BATTERY LIFE

The original battery we used was a single 1.5 volt bell type, and just for the fun of it we left it in the set to run to the last gasp.

As may be imagined, the receiver has had far more use than the average portable would ever have, because we have lost no opportunity of demonstrating it anywhere and everywhere. However, after almost exactly two months, the single cell gave up the ghost.

That's a pretty good indication that, with the correct batteries, this set isn't going to be hard to run.

Incidentally, Ever-Ready have brought out a new shape for the "A" cell in portable sets, but it will fit into the cabinet quite well with the new 45-volt blocks which are now the standard type to replace the old shape.

WATER PIPE AERIAL

Incidentally, if you should take your set away on a week-end trip, and arrive at your hotel wondering about a decent aerial to get stations some distance away, try clipping a wire from the set to the water service.

This dodge, up in the mountains one week-end, allowed us to tune in practically everything in Australia, although all Sydney stations were audible even on the small rod.

Incidently, the parts list on this set gave the chassis as 9in. x 7in. The correct size is 9in. x 6in. The actual layout diagram of the chassis was correct, and the little slip is not likely to fool anyone. We are sorry for it, but somehow, these blessed little slips will creep in despite about three separate checks on proofs.

Finally, don't forget to use low consumption dial lamps, unless you don't mind renewing your C battery a little bit oftener than usual.

The SLIDE WIRE BRIDGE

FOR MEASURING RESISTANCE, CAPACITY, INDUCTANCE

By DOUGLAS LINNETT

ALL radio experimenters at one time or another want a simple and effective means of measuring an unknown value of resistance, capacity, and inductance, when the slide-wire bridge answers most purposes. It is not so accurate as some other forms, but there is the advantage that a balance can be obtained very quickly, and the degree of accuracy is sufficient for most purposes.

Before discussing the type to be used, however, it is just as well to understand something of the theory of operation, as this will considerably facilitate its use. The Wheatstone bridge operates directly on the principle of voltage drops across a split circuit, as shown in figure 1, where three resistances are of known value and the fourth is to be measured.

SIMPLE PRINCIPLES

The resistances are so connected that R1 and R2 are in series, R3 and R4 in series, and the two combinations are in parallel; while the ammeter A1 reads the total current and the other two read for each branch.

Assume that the battery delivers 10 volts, and the sum of the resistances R1 and R2 is 9 ohms plus 1 ohm, or 10 ohms when the current is equal to E/R, or 1 ampere. In the other branch, R3 and R4 are 90 and 10 ohms, or a total of 100 ohms when the current will be .1 ampere.

The voltage drop between A and B should be equal to E x 1, or 9 x 1, or 9 volts, and between B and C it would be .9 volt, making the total voltage drop equal to the voltage of the battery. In the other branch between A and D, the voltage drop would be 90 x .1, or 9 volts, and between D and C 10 x .1, or 1 volt again making the total equal to the voltage of the battery.

So it now becomes evident that the point B is negative with respect to the point A by 9 volts, and at the same time is positive with respect to the point C by 1 volt. And D is negative with respect to A by 9 volts, and positive with respect to C by 1 volt.

Since both B and D are at the same difference of potential with respect to the other end of the circuit, there can be no difference of potential between B and D. If a galvanometer was connected between B and D, no current flow would be shown.

But for this condition of no voltage between B and D, the voltage drop across R1 must equal the drop across R3 and the drop across R2 must equal the drop across R4, which does not mean that the resistances must be equal. The ratio of R1 to R2 is equal to the ratio of R3 to R4, which is the essential for no difference of potential.

With no voltage registered in the galvanometer, the bridge is said to be balanced when the values of resistance can be expressed as:—

$$R1 : R2 :: R3 : R4$$

$$\text{or } \frac{R1}{R2} \text{ equals } \frac{R3}{R4}$$

With three of the values known, the fourth can easily be calculated.

This principle is carried into the slide-wire bridge, which presents no difficulties in construction, and will give the amateur a close approximation of the values of the various components in use.

The resistances R1 and R2 are replaced by a uniform resistance wire of any standard material, and for convenience should be mounted between two terminals set in an insulating panel. Underneath is fixed a scale, when the centimeter will be found most useful, with a convenient length of 100 centimetres with wire of No. 20 gauge.

But the connections to the terminals must be absolutely electrically sound, for otherwise there will be an increase in resistance of the unknown amount, and the accuracy of the bridge will be lost.

The slider may be simply made with a small telephone clip to which has been soldered a length of flexible insulated wire. Before the wire is finally fixed in position, however, the terminal should be clipped on to it. A firm connection is made by screwing down the terminal screw in the usual way, re-

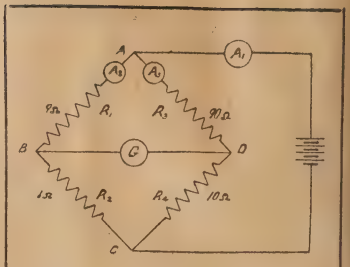


FIGURE 1

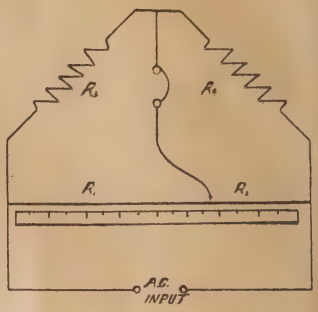


FIGURE 2

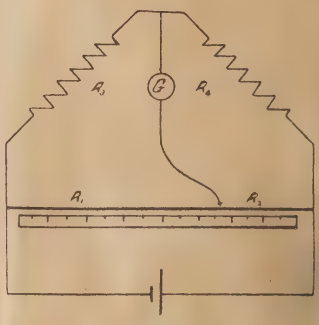


FIGURE 3

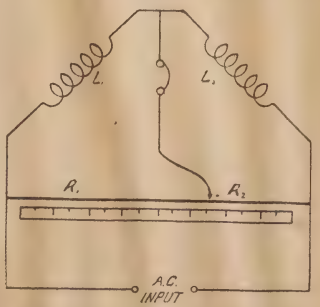


FIGURE 5

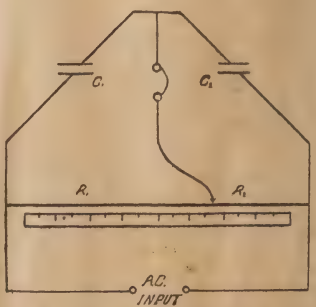


FIGURE 4

leasing it when sliding the terminal along the wire.

Figure 2 illustrates the bridge where R3 is a fixed resistance that has been accurately measured and is used as a standard. This accuracy largely determines the accuracy of the bridge. The unknown resistance to be measured is R4.

A galvanometer can be used to indicate balance as shown in Figure 3, but it will probably be found more convenient to use a pair of headphones in conjunction with a buzzer or a source of alternating current at audible frequency as shown in Figure 2. Any audio frequency source that gives a good signal in the phones can be used as a step-down transformer in the 60 cycle light circuit or the output from a broadcast receiver.

To balance the bridge, move the contact along the wire until the signal disappears, or is brought to a minimum. At this point the ratio of R1 to R2 in centimetres and fractions of a centimetre is equal to the ratio of R3 to R4. The value of R3 is known, so that the unknown is soon calculated. The actual resistance of R1 and R2 does not matter as long as the ratio in centimetres or any other measurement is known.

An example will illustrate. We shall assume the pointer found balance at 40 centimetres and the value of the known resistance is 200 ohms. The formula is:

$$\frac{R1}{R2} \text{ equals } \frac{R3}{R4}$$

Substituting the known figures, it becomes:

$$\frac{40}{60} \text{ equals } \frac{200}{R4}$$

$$R4 \text{ equals } \frac{20 \times 60}{40}$$

$$\text{equals } 300 \text{ ohms}$$

The capacity bridge is no more difficult, and is illustrated in Figure 4, where it will be seen that a known value of capacity C1 takes the place of the known resistance R3, and C2 is the unknown capacity instead of R4. Again the accuracy of measurement is largely dependent upon the accuracy with which the value of C3 is known.

The bridge is balanced in the same manner as previously, when the ratio of the reactance of C1 to the reactance of C2 is equal to the ratio of R1 to R2. But the reactance of a condenser varies inversally as the capacity, and therefore the capacity ratio of C1 to C2 is the reciprocal of the ratio R1 to R2. This is most simply written as an inverse ratio:

$$R1 : R2 :: C2 : C1$$

The capacity ratio is just the reverse of the resistance ratio because the voltage drop across the capacity varies as the reactance of the condenser and inversally as its capacity; in other words, if the value of capacity is twice as great, the voltage drop across it is decreased by one-half.

Measurement of inductance can be made by the circuit arrangement of Figure 5 by substituting the standard known value of inductance L1 in place of R3 and connecting the inductance to be measured in place of R4. The inductive reactance varies directly as the inductance, so that a direct ratio is used:

$$R1 : R2 :: L1 : L2$$

$$\text{or } L2 \text{ equals } \frac{R2 \times L1}{R1}$$

The result is not a laboratory measurement for the obvious reason that it neglects the resistance of the inductance, but it is sufficiently accurate for most amateur work.

THE WATTAGE OF RESISTORS

One of the things which trouble many home-builders from time to time is the wattage specifications of resistors.

Often it is required to specify a definite wattage limitation when ordering resistors, particularly of the wire-wound type, and we frequently get letters from people who obviously do not know as much about the matter as may be.

OHM'S LAW

Actually, there is nothing difficult about calculating the wattage required for resistor ratings.

It is just another sum, using Ohm's Law, which says, among other things, that the power dissipated in a resistor is equal to the number of amps. passing through it, multiplied by the number of volts drop across it.

If, for instance, we have a resistor across which the voltage drop is 100, and the current flow is 120 mills., the wattage of the resistor should be at least 12 watts, which is the product of 100 and .12.

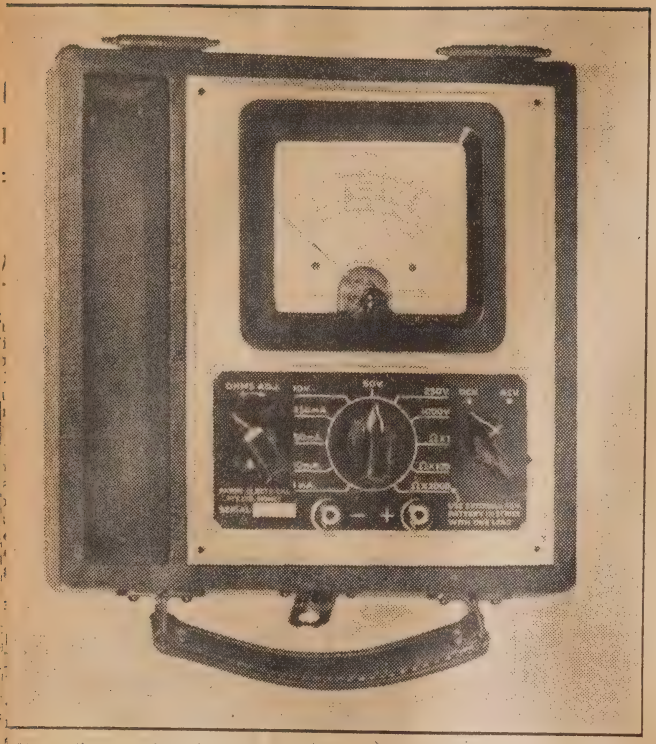
CALCULATING FROM RESISTANCE

It often happens that all we know is the resistance value in ohms, and the approximate current flow. It is this position that worries so many.

In such a case, the formula is to multiply the resistance in ohms by the square of the current in amps. In the above example, this means, if we have a 750 ohms resistor, and the current is 120 mills., the sum is .12 squared by 750. The answer is 10.8 watts.

If you like to calculate the voltage drop through 750 ohms with 120 mills., you will find it 90 volts. As the wattage equals number of volts by number of amps., we get once more the answer, 10.8 watts. So you can cross-check by getting at it the long way round.

It is very desirable to state the current flow when ordering resistors, in order that the right selection of either wire-wound or other type may be made.



Here is the meter from the front, and with the lid removed. The switch at the right, is not used at present.

☆

A multi-meter is something which every radio man should have on his workbench. Near enough is not good enough in most cases, and when in doubt, there is nothing to take the place of an accurate measurement. The multi-meter described in this article has the advantage of being very flexible, very comprehensive in its ranges, and easily obtainable in kit form if desired. Later on, we shall cover the simple addition of a rectifier unit which will enable the meter to read A.C. volts in addition to its already wide coverage.

☆

HANDY MULTI-METER

reading D.C. volts, mills, & ohms

ROM time to time we have described the construction of simple multi-meters. In every case, the articles have proved par-dularly popular. It seems that there always someone on the lookout for a meter, and no doubt there al-s will be.

he meter to be described here is a icularly good design, combining effi-icy with perfect simplicity. The work olved in making it up is very small, provided the components are accu-the results will be accurate also.

's will be seen from the photo-ohs, the meter may be obtained a carrying case, into which it very neatly, and with a compart-t at the side to house the test s.

THE RANGES

Naturally, the first thing one would ask when considering a multi-meter would be: "What will it measure?"

The answer is: Plenty!

First of all, the ranges of the meter are all selected by a single switch. This is of the rotary type, and has twelve positions, one of which is an "off" position, at which nothing is measured. It occurs when the switch arm is pointing downwards, and is never used.

In a clock-wise direction, starting from this down position at 6 o'clock, we commence with the milliamp. The ranges here are 0-1 mill, 0-10 mills, and 0 to 250 mills. There are very few readings which will not come within the compass of these three readings. Even the amateur transmitter is not likely to want readings greater than 250 mills, if he is a law-abiding citizen!

VOLTS

Following on the milliamps, we come to the volts. The ranges are 0-10 volts, 0-50 volts, 0-250 volts, and 0-1000 volts. Here, again, the ranges are great enough to cover anything anyone is likely to need. Moreover, the steps are such that accurate readings should be possible, no matter what voltage is required.

OHMS RANGES

Next comes the ohms ranges. There

are three of these, to give a particularly useful coverage.

The simple multi-meters in the past have usually employed one scale only, in which readings could be taken accurately to about 250,000 ohms, and by using a 45-volt extra battery in some cases, up a good deal higher than this. However, when small resistors of a few hundred ohms or lower were concerned, considerable difficulty was experienced to obtain an accurate reading.

Therefore, by the use of an ingenious circuit, we are able to get a much lower scale for position No. 1, which reads directly from the ohms scale, and has a full range reading of about 5000 ohms.

The second position provides for a reading of 100 times this value with useful accuracy, and by adding a 45-volt battery in series with one of the leads, position 3 will give 3000 times the range marked on the scale.

Thus, whether the resistor to be measured is high or low in value, accurate measurements are possible with ease.

ONLY TWO CONNECTIONS

Only one set of terminals is required for connection to the points in the circuit, all connections being taken care of by the switch itself.

There is, of course, an "ohms adjustment knob," with which the meter reading is brought back to reference point (full scale reading) each time the meter is used.

A second knob is provided which, at the moment, is not used. It can be used to switch in a rectifier unit, so that the meter may be used to measure A.C. volts from the special scale provided with the meter.

We will deal with the addition of this unit in next month's issue.

TWO SECTION SWITCH

The reason why all the ranges are immediately selected by the same switch is that it is of the two bank type. Thus it is possible to so combine the various connections that everything can be done with the one control, without the necessity of an extra switch as is necessary with the earlier types.

Apart from convenience, this lessens the risk of damage to the meter if the operator should forget to throw over this extra switch. He can, of course, still damage his meter if he tried to read volts on the milliamp scales, but we must give him credit for some intelligence, at least!

In the diagram, we have drawn the switch as two separate sections, one above the other. No trouble should be experienced in following out the connections, as they are all numbered for a start.

HOW IT WORKS

A careful analysis of the switching positions will make it clear just how the meter works. We suggest that you spend a little time tracing out the circuits, made in the various positions, before you start to build up the meter. Then you will have some idea of what takes place in each case, and are less likely to make mistakes.

In the first position, there is no connection to either top or bottom switch point, and the meter will not read. This is the "down" position referred to earlier in the piece.

In the second position, it will be seen that the meter is connected straight across the output terminals, without any shunts or series resistors. It will therefore read the normal range, which is 1 milliamp.

In the third position, there is a shunt across the meter equal to the three resistors, of 8.9, 1.778, and .444 ohms in series. With this shunt, only one-tenth of the total current passing through the whole circuit is allowed to go through the meter; thus we multiply its original reading by 10, to get 10 mills. In the fourth position, the 1.778 and the .444 resistors are acting as shunts, and the range is thus brought up to 50 mills, on the same principle. In the fifth position, the .444 ohms shunt alone is included, which reduced the flow through the meter so much that its range is multiplied by 250.

These three resistors are wound on a single piece of former, and care should be taken to see that the positive side of the meter is connected to the .444 ohms end—otherwise the readings will not be correct.

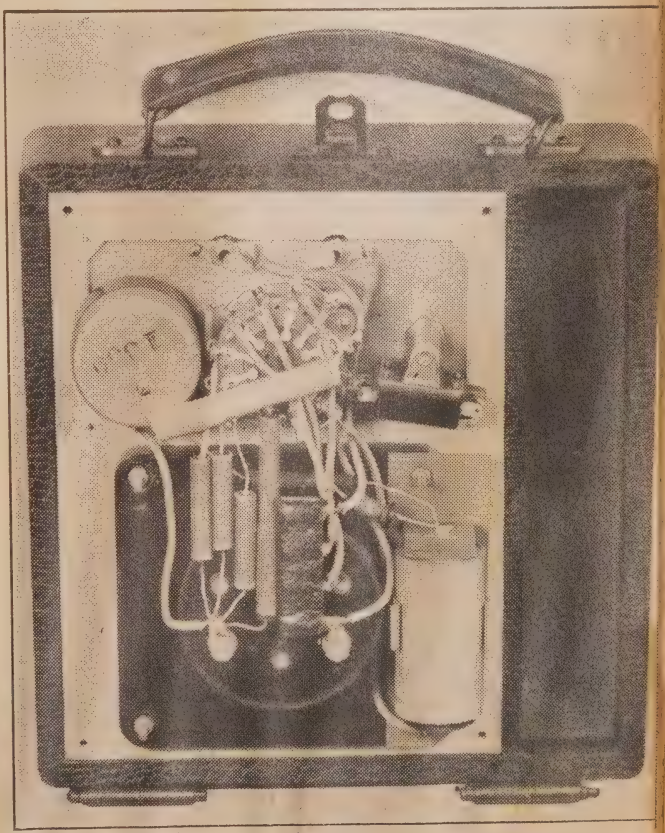
VOLTAGES

Coming now to the voltage rang the sixth position sees the shunts r moved from their position across t meter, although they are still in seri with one of the leads. The total resi tance of about 11 ohms, however, is small in comparison with the small series register (9900 ohms), that it c be neglected.

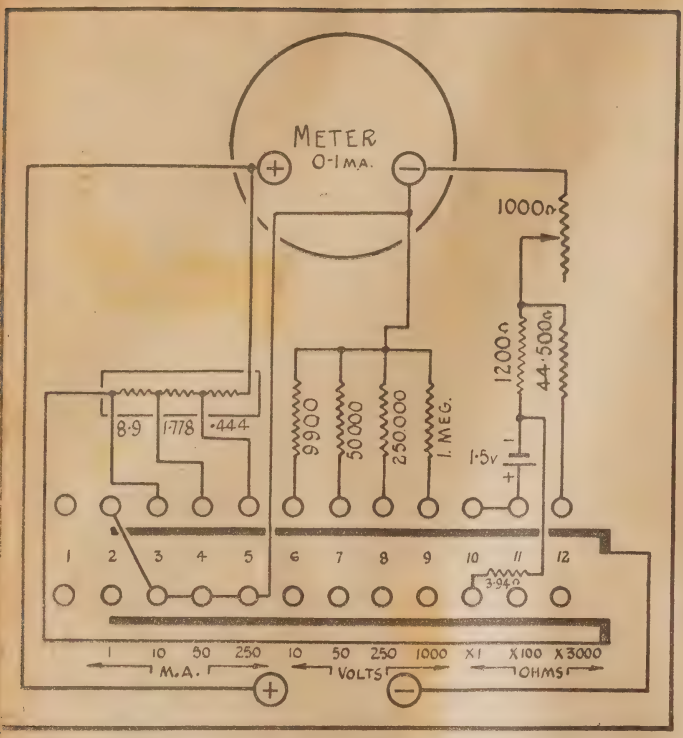
Now it should be remembered th all the meter can do, in fact, is to re 1 milliamp on full scale. If we wa to read volts, we must arrange a ser resistor so that, on full scale, there 1 milliamp flowing through the met Considering now the 10-volt sca ohms law will tell us that 10,000 oh total resistance is required for 10 vo to send a current of 1 milliamp throu the system. Therefore, the series res tor should be 10,000 ohms.

We must, however, allow for the res tance of the meter, &c., already in t circuit, when considering the rig dropping resistor. As this is appro mately equal to 100 ohms, so our to series resistor is made 9900 ohms.

In the second range, of 50 volts, require a total resistance of 50,000 oh in circuit. The odd 100 ohms is so sm in comparison with the 50,000 ohms th



Behind the panel. The battery is seen bottom right. All the parts are clearly visible.



This diagram, used in conjunction with the photograph on the previous page, is all you need to make up the meter.

we can neglect it this time, as we can do also in the case of the other ranges to come. These are, of course, the 250 and 1000 volt ranges, where our resistors are 250,000 ohms and 1 megohm respectively.

THE OHMS RANGES

Now we come to the ohms ranges. Here, again, we are back to the essential requirement of 1 milliamp through the meter. We have a small battery of 1.5 volts inside the meter, which is switched into circuit for ohms readings.

In position No. 11, we have a fixed resistor of 1200 ohms in series with a potentiometer of 1000 ohms for "ohms adjustment." If we set this so that the total resistance is 1500 ohms, naturally we will get full scale deflection if we connect the two output terminals together. The meter will read full scale, and the resistor to be measured will cause a reduction in current flow when connected across the test prods.

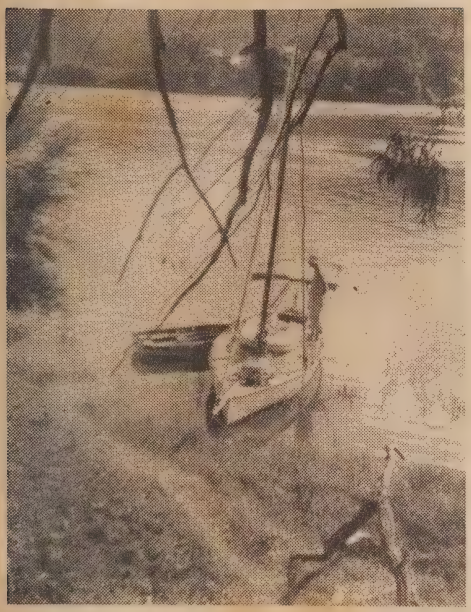
The amount of this reduction is registered on the scale as ohms to save making an ohms law calculation each time we wish to make a measurement.

In order to get a lower full-scale reading of ohms, for testing small resistors, position 10 has included a small resistor, which, in series with the shunt resistors already in circuit, make up 15 ohms. If you like to work it out, you

(Continued on Page 32)

ROUND AND ABOAT! with "LITTLE JIM"

Actions speak louder than words. This account of "Little Jim's Mate" on tour was written by a member of our Circulation Department who borrowed the set for his holidays. The impressions are those of a layman, and not a technician, hence their special interest.



☆

A delightful photo of the boat making fast for the night.

☆

AT least two radio experts said it couldn't be done, and yet the problem (to a complete amateur) seemed fairly simple. It was to install in a small boat a radio that would receive at least one or two Sydney stations while the boat was cruising the Hawkesbury.

"But the Hawkesbury," wailed the experts, "that's the worst district for reception, particularly round about the Colo:" The Colo was one of the Hawkesbury's tributaries we wanted to visit, so the problem was put up to "Wireless Weekly."

And did they have the solution?

They did. In fact it was on the Editor's desk at the time our troubles were being expounded. We called on him and then and there he introduced us to "Little Jim." On looks Jim wasn't very impressive. Just a couple of knobs, a switch, a few wires, and two small batteries, and we had doubts that he'd be any sort of a companionable shipmate. But we rolled him in paper, and took him aboard, together with a pair of ancient headphones, and a length of very second-hand wire.

A "KNOCKOUT"

From the start "Little Jim" was a knockout. The smallness of the set was what appealed to a boating man. Lashed to a stringer he took up no room, and was always at hand to get on with his job. His aerial was simplicity itself. We just shinned to the masthead (about 23 feet above the water), hitched on the bight of the wire, took one end to the outer end of the boom, and led the other through the hatch to Jim's terminal. The earthwire was led to a brass seacock and Jim was rigged.

The first test looked hopeless, because we were moored close in under a high and very damp cliff about two miles above Peat's Ferry, and it was midday. But Jim piped up at once, and with very little knob twisting gave us all the Sydney stations, and even chucked in a few interstate broadcasts.

One part of the head set for each man was all he needed to give us plenty of volume, and he came in full strength on more than a dozen stations every night without interference. Hanging one phone on a hook near the head of the bunk, it made a good speaker. "Little Jim" has another very strong advantage in a boat. You don't have to connect him in any way to the electric system of the engine (our engine had none anyway, bar the magneto), and so you don't get any machine-gun effects from the sparking plugs, so he'll work while the engine's running.

The real test came at Portland, where the Colo enters the main river. Just to give the doubters the lie, "Little Jim" came in just as powerfully as ever.

We tried him, too, sailing down the coast from Broken Bay to Sydney, and he was on the job all the time.

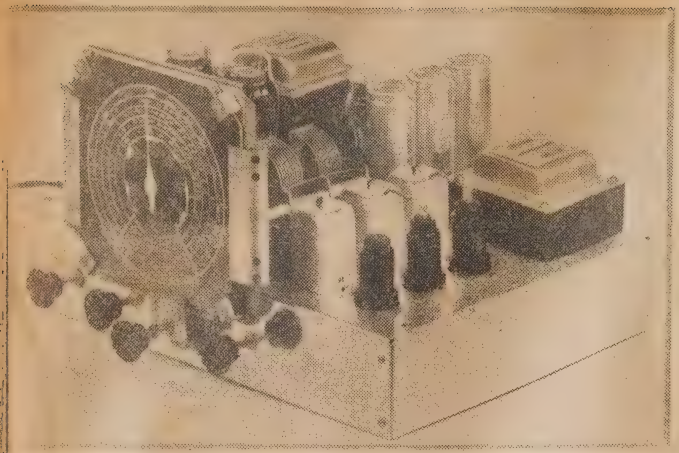
What amazed us was the simple, even crude, conditions of installation in which the great little set seemed to re There wasn't an insulator on the b and no wires were soldered. The ae —just cotton-covered copper wire, often soaked and frequently dang on the wet deck. There was about 4 of it altogether.

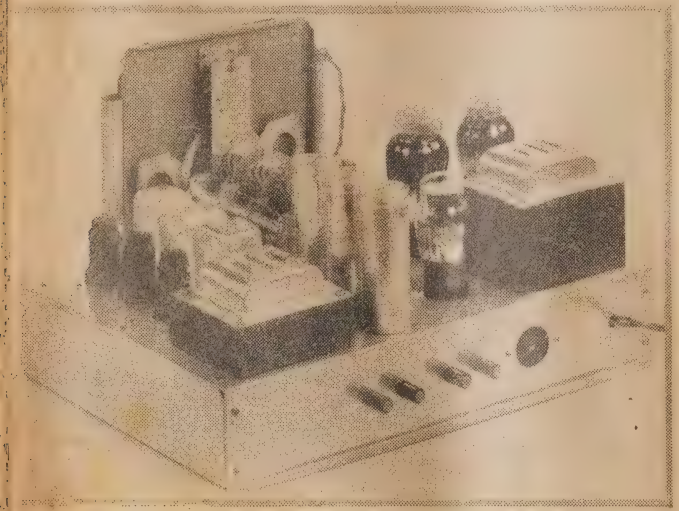
"Little Jim" is just the set for a b No fuss or bother to instal; no fa aerial to foul rigging or spars; sn and compact, and sure reception all time. Jim earned a permanent place our ship's complement.

In addition to Sydney stations regularly received 2GZ, 2KA, 2GN, Newcastle stations (very strongly), Kempsey. The Brisbane stations c in well, and so did 4MB Maryboro and we could get several Victo stations, and even one in South A tralia.

WHAT? NO EARTH?

THE





The top picture shows the receiver from the front. As there are only four knobs required, a dummy fifth knob may be mounted on the cabinet front to balance the panel. Left to right they are: Audio Volume Control, Gramophone Change-over Switch, Tuning Control, and Sensitivity Control.

Below is the chassis from the rear. The filter choke is in the foreground, with the R.F. valves and coils to the left. The output valves, power transformer etc. may be seen clearly in both pictures.

Here is a new high quality Radiogram for the music-lover —designed for the finest possible reproduction of local broadcasting stations and also from gramophone records. It is easy and inexpensive to make, and has ample volume for the average home. The use of the T.R.F. tuner, coupled with a resistance push-pull amplifier ensures life-like reproduction of music and speech. All the parts are standard, and may be easily obtained from any radio dealer. When correctly operated preferably with the speaker mounted on a plain 3ft. baffle, rather than in a cabinet, your results will be equal to the finest radio set you have ever heard.

In this article we propose to describe an eight-valve receiver which is particularly suitable for operation with a gramophone pick-up. In other words, it is also an eight-valve radiogram.

We have called it the "Junior Radiogram," because although it has eight valves that isn't a large number when compared with bigger jobs we could like. Furthermore the circuit is a very simple one, and costs very much less than one would imagine from the imposing array of valves which are used.

TO THESE RADIOGRAM FIENDS!

Before going any further, let us say something about the enthusiasts of the gramophone record, of which company we must plead guilty to membership.

In our experience, radiogram enthusiasts are divided into two rough classes —those who want big volume and those who don't. It goes without saying that all want the very highest quality, although some want it in a higher degree than others.

Strangely enough (or is it strange?) the man who likes to sit a comfortable half-mile away from his speaker and enjoy the music is also the man who very often wants to tune in the world on his radio. If it's on the air, he wants to get it. Having got it, he settles himself to watch the magic eye winking on London, with 10 watts of audio beefing out all the static! More or less!

The more modest enthusiast is content with less than this. He still likes to make his windows rattle on occasions, but he isn't interested if he has to tie them down as well. Five or six watts is enough for him, as long as the quality is there.

He rarely listens to any but the local stations. He is keen on the celebrity concerts, and, of course, never misses a session of records on Sundays. As a result, he is more concerned with getting the finest reproduction of local stations than in chasing stations in Siberia or Yugoslavia.

Personally, we have considerable sym-

JUNIOR RADIOGRAM EIGHT

for fine quality on radio and records

pathy for this type of listener. He stands to get more enjoyment from his radio, possibly, than any other. And with his store of good records growing, little by little, he will find a double use for his receiver.

This is the man for whom the EIGHT-VALVE JUNIOR RADIOGRAM has been designed and described.

PERFORMANCE

In principle this receiver is very similar to the Stereoscopic Eight described in "Wireless Weekly" last year. There is, however, an essential difference in the detector circuit, which in last year's circuit used a somewhat unwieldy reflex system with quite a few components to be fitted in.

The positive-bias detector is the essence of simplicity, and appears to have no snags at all. The older type showed up in one or two cases, with a strange form of audio flutter on full volume settings, which was not so easy to control.

The audio quality from the amplifier is really all that anyone could desire. It is a standard type of circuit, using a resistance push-pull system with a valve phase-changer.

The circuit varies a little from the usual in that triodes are used in the detector and phase-changer sections instead of pentodes. The triodes are more convenient to hook-up, and the performance, to all intents and purposes, is exactly the same.

The percentage of distortion with this type of circuit is particularly low, being, in fact, almost negligible. The frequency range extends well beyond anything you are likely to hear from either records or broadcast stations. It would, in fact, be very difficult to hit on a circuit which we could say would be so much better than this, that the difference would be noticeable.

It is really a development of the circuit which was first made public in the days of the Amplifier Championship in 1934, and owes much to the original "Standard" circuit in 1933. Since those days some of the very cleverest engineers have had a shot at improving and enlarging on it, and this version is one which, apart from our small modifications, was publicised by the A.W. Valve Company a few months ago.

OUTPUT

The output of the set would be in the region of 7 watts clean. More than this could be obtained, but the percentage of distortion would increase rapidly. The phase-changer valve can only handle a certain amount of input and give a certain amount of output. These are sufficient to drive the 2A3's to the above-mentioned output without trouble. In an effort to improve on this volume overloading will occur and quality will fall off.

Not that the average men could stand more than this job has to give. Most of the time it will be operated well below its maximum output. There is quite enough volume to give realistic and thoroughly satisfactory reproduction of heavy orchestral records, whenever these should be used.

PARTS LIST

1 Chassis, 16 x 11 x 3 inches.
1 Edgelit tuning dial (broadcast band).
1 3-Gang tuning condenser.
3 Coils—aerial and 2 R.F. types.
1 Power transformer—385 150 mills., 6.3 at 5 amps., 5v. at 3 amps., two filament windings.
1 Filter choke—150 mills.
3 600-volt peak electrolytics, 8 mfds.
1 1.5 meg. resistor.
1 1 meg. resistor.
2 .5 meg. resistors.
2 .25 meg. resistors.
3 .05 meg. resistors.
1 .02 meg. resistor
1 .5 meg. potentiometer.
1 5000 ohms potentiometer.
1 25,000 ohms voltage divider.
1 4000 ohms resistor.
1 2000 ohms bias resistor.
1 375 ohms wire-wound resistor, 200 mills.
1 Tubular 8 mfds. electrolytic.
3 .5 mfd. tubular condensers.
4 .1 mfd. tubular condensers.
1 .05 mfd. tubular condenser.
1 25 mfds. electrolytic.
1 .0001 mfd. mica condenser.
Sockets—5 octal, 3 4-pin, 1 5-pin.
Valves—2 6K7, 2 6C5G, 1 6J7, 2 2A3, 1 83v.
Speaker—Higher quality type, 750 ohms field coil.
4 Terminals, knobs, hook-up wire, &c.
Switch for pick-up.

RADIO RECEPTION

We were very pleasantly surprised when it came to testing out the tuner. It is of the T.R.F. type, using the new Trolitol type tuning coils. One of these surprises was the reception of New Zealand, free from interference, at full speaker strength, on about 10 feet of wire! For a while we thought it was a local or a strong relay station. That will give you an idea of how it will pi in stations.

Further down the dial, naturally, t selectivity shows up very poorly in cor parison with a good superhet. Howev any of the interstate stations whi could be cleared of the strong loc were there with plenty of wallop, a the little chaps at the bottom of the d were well in evidence, particularly th which in signal strength poked th heads through the general mess.

The separation of locals was so ea that we consider it certain that, exc in very bad localities, no one sho have the slightest trouble in getting the programmes without the slight interruption from any unwanted stati

The quality from the locals, as wo be expected, is streets ahead of the or nary sharply tuned superhet. Some you may still doubt that the differe can be noticed. Let us assure you t it most certainly can. There is a defi tion about the high frequencies wh gives exceptional realism to both mu and speech. The exceptional freed from distortion makes the high nc which are there quite easy to listen and tone controls are, of course, thi of the past.

We'll personally chop down the ae mast of anyone we detect wiring c densers across the output or using other 'mutilation method for the h notes of this set! If he should hap to be a bigger man than we are, w tell the police.

THE CIRCUIT

Now for a brief run through the cuit.

First, there are the two R.F. am fiers. You will notice that in the ac receiver these valves are shown as m types—6K7's. In the circuit they marked 6U7G's. There is no differe between these valves except in the struction, and we used the metal t because we wanted to avoid using v cans. These should be fitted with glass valves. 6D6 types are also jus suitable, and in the 2½-volt types 58's would be just as good.

The detector is a triode—we use 6C5. Again, the glass valve marked the diagram is the 6C5G. A 76, an the 2½-volt series, a 56, would give same results.

This is the positive-bias detector. circuit gets its name from the fact the output is taken from the cat and not the plate circuit. The loa sistor is wired between the cathode earth, so that the cathode is, of co at a positive voltage with respec earth. The .0001 condenser is the bypass. The plate of the valve is nected to 100 volts positive, and t all there is to it.

This detector has excellent characteristics and has proved very successful indeed.

You will remember that it was used in the NEW HIGH QUALITY RECEIVER described in the June issue of "Radio and Hobbies." Quite a few of these sets have been built, and our reports of them are all most encouraging.

THE DRIVER STAGE

The coupling to the driver is via an R.F. choke, to keep the R.F. out of the audio system. The lead from the choke runs to a switch, which allows the change-over from radio to pick-up. This is perfectly straightforward, and almost any type of switch will serve in this position.

Our recommendation is towards one of the rotary types similar to those used for wave-changing in dual wave sets. The contacts on such a switch are apt to be much better than with the ordinary toggle types.

If you care to take the trouble, you could use a switch similar to the one employed in the original Stereoscopic Amplifier No. 2. This switch has two points, which were switched to about five points each.

The second set of connections may be made to vary the load across the crystal pick-up, if one is used, thus acting as a bass control.

This, however, isn't essential, and you can please yourself about it.

PENTODE OR TRIODE

The connections for the driver valve in the circuit are to use the 6J7 or 6J7G as a pentode.

This connection will give very high gain and provide that the audio amplifier will be well loaded up with only a fraction of a volt input.

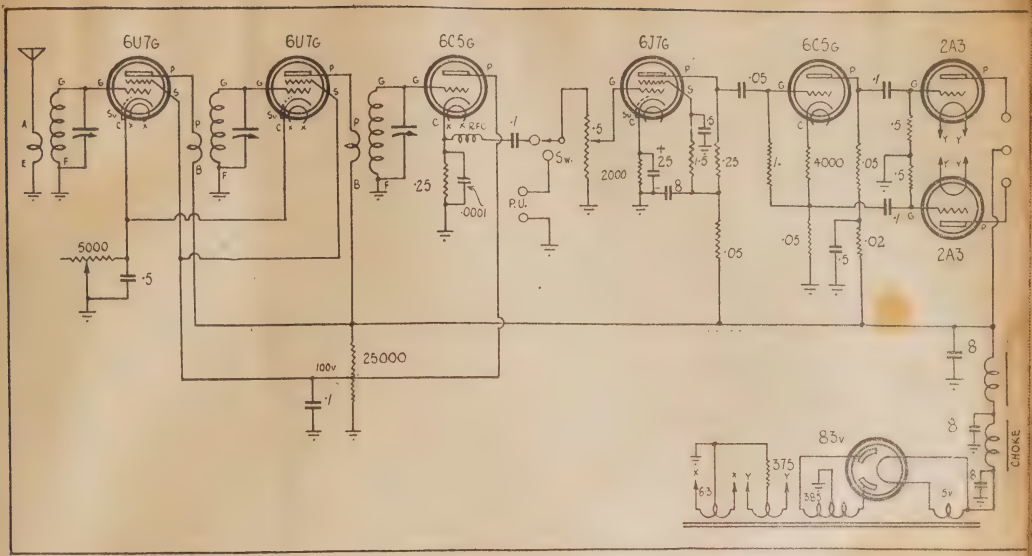
This connection is used with the original circuit, as issued by the A.W. Valve Company. Unfortunately, we have found this pentode connection has one fault, and that is a tendency to a higher hum level than some would like. A good deal seems to depend on the characteristic of individual valves—some of them are as quiet as the grave and others are not so quiet. We don't mean to suggest a really bad hum level by all this—it isn't really audible over even the quietest music, but it spoils the idea of a dead-quiet background which we like so much.

If you are unlucky enough to strike this trouble, there is a very simple remedy. The amplifier was originally intended to operate on an input of about .25 volts for full output from the 2A3's. Now we are using the set mainly for local stations, for which we get a very strong signal at all times, and a crystal pick-up, which again delivers a very strong signal.

So that, if we connect the 6J7G as a triode, and not a pentode, we will drop the audio gain quite a bit, but avoid any possibility of hum in the output.

The gain is still sufficient to overload everything both on radio and pick-up, and, after all, there's little point in having more than this.

The change-over simply consists of removing the present connection to the screen of the valve, plus the .5 mfds.



Here is the circuit. The speaker field has a resistance of 750 ohms. Everything is quite straight forward. A condenser, tubular type of .5 mfd. is sometimes connected right across the high tension end of the voltage divider to earth—although not always needed, it is a good idea to include it. This condenser isn't shown here.

bypass condenser, and in connecting the screen of the valve across to the plate. The present bias resistor should be quite all right, although it is possibly a little better to increase this to 5000 ohms.

Anyone should be able to follow these instructions, and it won't do any harm to try out both ways in any case.

THE PHASE CHANGER

Next on the list comes the phase changer. The original circuit used a pentode connected as a triode in this socket, but again we have used a plain triode for convenience.

There is nothing catchy about this part of the set—you have seen the circuit plenty of times before.

From here the output goes to the 2A3 valves, resistance capacity coupling being used.

The 2A3 valves are operated under self-bias conditions, under which they use a 375 ohms bias resistor and draw about 60 mills. each. The resistor, therefore, should be a good-sized one—200 mills. if you can get it. When our photo was taken we had two 750 ohms in parallel, simply because we hadn't a larger 375 ohms type on hand. Since then these have been replaced with a resistor rated at 200 mills. and as big as a battleship!

The output valves are 6A3's, because our transformer had a pair of 6.3 volt windings. If you have a 2.5 volt winding, then the 2A3 is the type to use. There appears to be no difference between the valves except in the filament voltage.

THE POWER SUPPLY

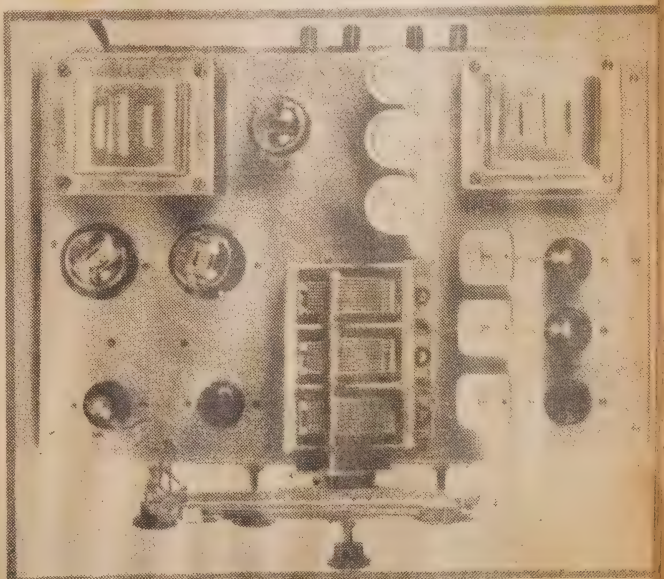
The power transformer should be of the heavy-duty type—150 mills. secondary rating. The output valves need 120 mills. each, and the others will be taken up by the rest of the set.

The filter choke, included for perfect smoothing, should also have a 150 mills. rating.

Used with the three electrolytic filter condensers, there is no hum at all in the output.

The speaker field required is 750 ohms. The rectifier, being an 83V, more voltage will be obtained from the supply th with the conventional 5Z3. It will nearer 400 volts than anything e The 750 ohms field will drop this ab 100 volts, and when the 60 volts b is allowed for, the total of 250 volts the 2A3 plates will be just about rig

(Continued on Next Page)



A plan of the chassis which gives a good idea of the layout. Note that we mount the gang on its back, because we wanted the dial to be kept as low down as possibl Aerial, earth, and pick-up terminals are seen at the back of the chassis.

If you care to have a special transformer for 400 volts per side, you will make sure of having full voltage, or maybe a fraction more, all round. However, the standard type will be perfectly satisfactory.

Don't worry about putting 300 volts on the plates of the R.F. amplifiers. If you run the screens at about 75 volts, which will be ample for plenty of gain, they will be quite happy.

CONSTRUCTIONAL POINTS

The construction of the set is very simple. Have a look at the diagram showing the under-chassis wiring. You will see that nearly all the resistors and condensers are mounted on a central strip in the middle of the chassis. The wiring diagram shows these in their correct positions. Mounting them this way greatly simplifies the construction and the wiring. One or two others you will notice mounted on their own—in some cases these will wire straight from the valve socket to an alarming point on the chassis, but you can place these on little terminal strips of their own, if you wish to make a firmer job of it.

The leads from the coil cans to the valve may not be in place when you buy the coils. If you remove the cans and solder leads to the grid terminals on the coil assembly, you can push them through holes in the top of the cans and reassemble. Otherwise the leads to the grids of the R.F. amplifier will have to run down through the chassis. Either way will be O.K.

The speaker to be used should be a good one, which will handle up to 10 watts of power. The new Amplions, types V and VL, would do very well indeed, and in the Rola range there is the K12, or, better still, the big G12. Smaller speakers than these should not be used, as they will not stand the operating conditions of the set.

A HANDY MULTI-METER

(Continued from Page 26)

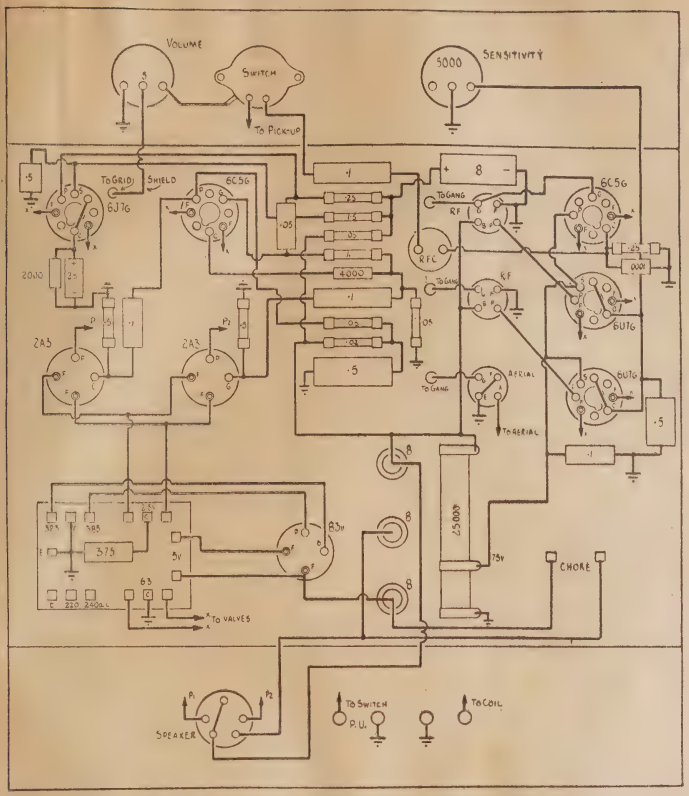
will see that this resistor will take nine-tenths of the total current flow, and the meter will read only one-tenth of the total value. Thus its sensitivity is reduced ten times, and we can divide our actual reading by ten.

In position No. 12, a series battery of 45 volts is required, and we can now use much higher resistors for full scale reading, as we have the extra voltage to provide current flow. Our scale is now multiplied by 3000.

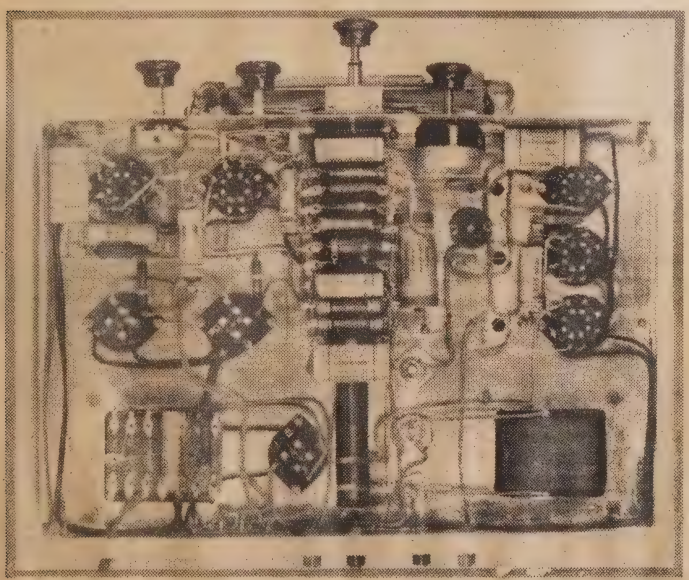
Our circuit diagram, in conjunction with the photo., makes the wiring self-explanatory. No. 1 terminal on each switchbank may be taken as the one which has a square opening in the middle, and it is immediately above the lug which connects to the common connection for each.

When buying parts, you would be well advised to specify the shunts, &c., for use with your particular meter—these are readily obtainable. The whole job is also procurable in kit form, with a special aluminium front panel and a case, to obviate any troubles in getting accurate resistances. The meter can be relied upon for accuracy and simplicity. No one should have any trouble in wiring it up.

WIRING DIAGRAM OF RADIOGRAM



Here is the wiring diagram of the set. It is drawn to scale, the chassis measuring 15 x 11 x 3 inches.



This actual photograph of our chassis, shows an exceptionally clean and neat layout.

ON THE AMATEUR BANDS

by A. V. Bennett

CONDITIONS GENERALLY POOR

ABOUT MAGNETIC STORMS

EUROPEANS ARE HEARD IN MORNINGS

would not be very difficult to suggest the phrase most commonly used on high frequency bands during the last month. "Conditions punk," or, more grammatically, "very poor." has been bandied back and forth between local and overseas hams with monotonous regularity.

With the exception of a few peak periods, falling off of conditions has been noticeable. For a time there seemed to be signs of improvement, but these did not live up to expectations. Of course, some of the very active amateurs have been successful of late, but I very much doubt if the chap with only limited time for operating can produce a log which will startle the natives.

For long distance contacts, 20 metres has been best, new countries having been worked and heard. During the afternoons, DX has been mostly confined to American QSOs, with a few Europeans cropping up occasionally. With an efficient band switching receiver, plus a quick change transmitter, it is possible to enjoy some success with conditions as they are at present. In many cases, when one frequency is poor, a higher or lower frequency proves much better. Conditions have been changing very rapidly, and at times the various periods of good DX last for less than an hour.

SKIP EFFECT

Good use can be made of skip distance effects. By checking carefully on one band, and determining what is going on, it is possible to arrive at definite conclusions concerning other frequencies, and take advantage of best prevailing conditions: e.g., if skip is very short on 20 metres, and stations within a radius of 100 miles or so are coming through strongly, we may conclude that the Heavyside layer ionisation is heavy, and high frequency signals on 10 metres are being returned to earth. From this same short skip on 20 metres we can tell that the skip on 40 and 80 metres is reaching point zero, making these bands useful only for short distance communications.

EFFECT OF MAGNETIC STORMS

Magnetic storms are most unsettling agents to conditions on amateur bands. At present there is evidence that such storms are very prevalent, conditions changing over periods of two days or less.

A report received from W2AZ indicates that such conditions will continue for some time. W2AZ is a keen observer of ionaspheric behaviour, and is in constant touch with the scientists at N.B.C., whose job it is to observe activities on the various frequencies and draw conclusions which will assist those using short-wave lengths for communication purposes. From 2AZ's report it appears that in the coming weeks peak periods will be of two or three days duration, with very poor conditions intervening.

W9RUK was a familiar station which reappeared after a long absence from 20 metres phone band. Ike has been concentrating on other continents with other aerials. A few years back he was one of the outstanding American phones. He asked that his 73 be passed on to all his old friends in VK.

EUROPEANS

Between 6.30 and 7.30 a.m. European stations have been coming through, but they are becoming later each morning, and at present Europeans are to be heard as late as 8.30 a.m. Several good phone signals have been consistent during the mornings — LA5H, 14,100 kcs, HA1P, 14,100 kcs, SM6RF, 14,080 kcs, F8AF, 14,080 kcs, and a number of PA stations being most regular. VK4s have been getting among them.

ON 40 METRES

Forty metres is not changing as quickly as expected. Main DX during the evenings is American and Asian; with a few Europeans during mornings. Interference on forty is bad. Even with the comparatively small number of VKs operating it is difficult to go right through a QSO without interference. Imagine what it must be like for the Ws. It is rumored that U.S.A. amateurs will be using 100 kc channel on the 40 metre band for phone the same end as was given over to commercials. Looks as if there'll be bitter wrangling over this.

HEARD IN U.S.A.

Americans often comment on the many VK stations heard in their country on 40 metre phone. If American amateurs do use the 100 kc channel for phone there will be quite a move by VKs to 40 metres, and we will find that portion of the band used by Ws left severely alone by locals, as is done on 20 metres.

Hear lots of boys on forty receiving T9 reports, when the E.C.O. notes sound like a flock of angry wasps.

Some very good records may be heard in the mornings from amateur stations on forty. Quite a number of interstate hook-ups are arranged on this band. VK4FL and VK5RJ have very nice signals, clean and good quality phone.

African stations should make their appearance in the mornings of the very near future, mostly on c.w. Some have already been heard and worked, but have not been able to determine the exact frequency and calls.

TEN METRES

Ten metre activity seems to have waned. A few locals are still active. Week-ends are practically the only time when conditions are suitable for most of us to work DX.

During a contact with K6MVA on twenty, he commented on the absence of VK signals on ten metres, when conditions in K6 appeared to be good. The band is behaving in an unusual manner, and it is hard to predict when best operating times will prevail. A full 24 hour watch is required; good periods are limited to half-hour or so, around 9 to 10 in the mornings for Ws and perhaps a K6 or two. Band brightens early in afternoon for short period. Never hear any Europeans these days, but sometimes an occasional South American.

REGULAR SCHEDULES FOR 5M.

The U.H.F. section of the W.I.A. has commenced regular transmissions on 5 metres for the benefit of amateurs requiring a signal for test.

Here is the schedule of transmissions:—

Mondays, VK2HZ, 56,000 k.c. C.W. only from 8 to 9 p.m.

Tuesdays, VK2VN, 56,080 k.c. C.W. only, from 8 to 9 p.m.

Wednesdays, VK2NO, 56,400 k.c. 30 minutes phone and 30 minutes C.W., 8 to 9 p.m.

Thursdays, VK2AJK, 58,320 k.c. Phone and C.W., 8 to 9 p.m.

Fridays, VK2MQ, 56,240 k.c., C.W. only, 8 to 9 p.m.

Saturdays, VK2IQ, 56,190 k.c. Phone and C.W., 8 to 9 p.m.

Sunday nights, Open for general contracts and discussions.

In the daytime on Saturdays and Sundays, transmission will be on the air from several stations, mainly between the hours of noon and 1 p.m. for the benefit of distant stations and observers, for the reason that experience shows that conditions for possible long-distance communication are most likely to be favorable around this period.

20 METRE ACTIVITIES

Most active station on 20 metre phone during the morning in VK2 is still 2AGU. Has kept a schedule with a G8 consistently for more than a week. The beam must be working.

Informed by VK2AOX that since he came on the air in December he has worked 162 individual Europeans, with a total of 52 countries. The answer is—he doesn't sleep.

Between 6 p.m. and 8 p.m. has been a good time for interstate stations. A few VK6s have been coming through. VK6AF is very consistent, with a nice average R8 phone signal. Allan is running 25 watts input to a half-wave doublet, fed with an 80 ohm line. Has completed a rotary beam, but can't decide type of support to use. Drive mechanism has also been completed. He reports VK6 conditions as follows: American stations 8 GMT to 12 GMT, at times extending to 14 GMT, phone and c.w. Europeans during mornings—zero GMT about best. HB9BQ on phone is R9 most mornings. In past few days 6AF has worked VP9G, XZ2AZ, XZ2DM, and a few ZS stations. Has worked over 2000 Ws in past two years, with a return of 900 cards. Speaking about QSL cards —notice in May issue of Q.S.T. that YS2LR in Salvador has been in trouble with the local authorities, mainly brought about by amateurs thoughtlessly addressing his cards to Salvador, whereas he specially asks that they be sent to W4EVX, he himself being under cover. Care should be taken in addressing QSL cards for amateurs in countries where it is necessary to operate under cover.

YV5ABQ

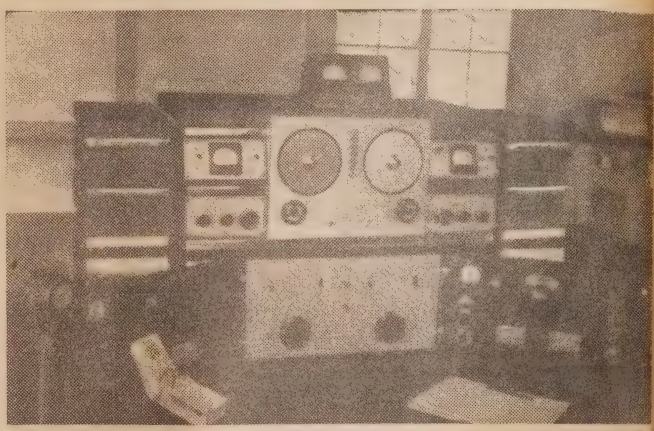
YV5ABQ on 14,100 kcs has been consistent with a good R7 phone, around 9 on most evenings. Good strength KA signals are coming in at same time; short and long skip operating at once.

Canadian phones are more numerous, and very strong around 7 to 8 p.m. Some come through during early mornings, all looking for VK contacts. VE5ADJ on 14,100 kcs is very reliable. Uses a rotary beam. FN1C, ex-VU2GN, was a surprise packet, making a sudden appearance on phone, approximate frequency 14,050. Worked VK4 but did not respond to frantic calls of two well-known VK2s in Sydney, both calling him on same frequency. The full wave zepps used were blamed, I believe, for the lack of reply from this very attractive DX. Hope FN1S comes to light again some evening.

W.A.S. FOR 2TI

Hear that VK2TI has at last worked all States of America, and is now taking it easy, awaiting verification cards. Good work, Wal; what comes next? Phone W.A.S. with the new modulator, or W.A.S. on ten with the three element rotary?

PICTURES FROM PK6XX



Two pictures of the Archbold Expedition in Hollandia are shown above. Harold Rami PK6XX, brought them down on the Guba with him. One shows operating position PK6XX—very complete and desirable. At top can be seen Hallicrafters Dual Diversi Receiver, in addition to which two H.R.O. receivers are used, one on each side of t desk. Many of us would be content with just one of those receivers. The station al boasts three transmitters, and replacements for all tubes. The other picture shows t Expedition's new house in course of construction. The beam antenna platform and tow are shown on the right, with the radio shack below. The platform was constructed that adjustments to the various beams could be easily made. Various types of bea were tried—most of them successfully.

Round about 6 p.m. high frequency end of band, CT1ZZ, CT2JS, HI6O, and HC1FG have been very good on c.w. During recent CT contest, numbers of their stations could be heard. No doubt that a DX contest brightens things up —should be more of them. Won't be long to October.

Those desiring phone contact with Papua (VK4) should not overlook VK4NK on approximately 14,060 kcs. Norman puts in a very nice signal, and a thoroughly enjoyable QSO can alw be had with him.

Six p.m. good time for XE station phone. Several have good R8 sig XE1T is most consistent.

Quick fading of signals has some vantages. If one is lucky a station be worked at R9; at conclusion of it conveniently fades out, allo another station to appear on same quency. Unfortunately this do always happen.

BUILDING

This photograph shows the appearance of the unit when completed.

WHEN starting out to master the code, one must have a key, and some means of generating sound, so that he can hear what he is ing to send.

Given the key, possibly the easiest hod of producing the sound, is to a buzzer and a battery in series h it. With the average buzzer, the note is rather rough, but it's honest.

Of course, there are high-frequency buzzers available, which give a much higher-pitched sound, very like the clean whistle of a well-filtered transmitter.

GOOD NOTE DESIRABLE

The desirability of having a good note from the Morse code set is pretty obvious.

Most fellows set out to learn the code so that they can read stations on the air, and probably, in order to qualify for an amateur transmitting licence. Now a rough note, something like that of the ordinary buzzer, is definitely not used in amateur transmission, or for that matter, in any other kind of self-respecting equipment.

Practice with a buzzer, therefore, isn't a great help when one will never have to read signals on the air which sound that way. It is infinitely better to start with something which can give a good imitation of the real thing.

Also the amateur examinations are carried out with a valve oscillator, to give just the kind of signal you will have to copy later on, when you start up.

THE VALVE OSCILLATOR

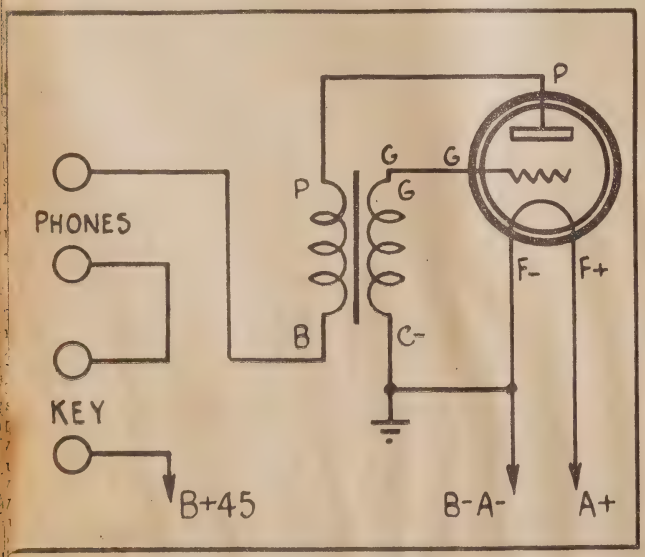
This is where the valve oscillator comes in.

The valve oscillator is just what it sounds. An ordinary valve — it may be battery or A.C. and of almost any type, is wired into a circuit so that it oscillates at an audible frequency. The key, and a pair of phones, or a loudspeaker, are connected in the B battery circuits, and the job is done.

The result is a clean whistle just as you will hear when tuning over to a good C.W. station on the air.

The strength of the signal from the unit, and to a certain extent, its pitch, is controlled by the voltage applied to the plate. Usually 45 volts will be enough to give vigorous oscillation, and a good loud signal.

One of the big advantages of the oscillator over the buzzer type is that no one in the house need know you are using it. In other words, a buzzer going for any period tends to spoil the tempers of unsympathetic members of the household. But the valve oscillator, when working with head-phones, can't be heard by anyone but the operator, who can thus work away to his heart's content, without being a nuisance to anybody.



The circuit is the essence of simplicity.

THE COMPONENTS

Now let us get down to the components required. We assume that you have a transmitting key and a pair of phones. Make sure your key is a good one, if you intend to use it for transmitting later on. A poor key is a nuisance from the start, and you are bound to throw it away sooner or later! So get one which will do you for always.

The phones need not be particularly good ones, although if you have trans-

A SIMPLE AUDIO OSCILLATOR

for Morse Code practice

One of the best ways to write a technical article which will be really popular, is to discuss the Morse Code, how to learn it, or anything at all about it. Someone once said of eggs that everyone was either eating eggs, just about to eat an egg, or just coming away from having eaten an egg! Well, the Morse Code among radio enthusiasts is something like that! Someone is always learning it.

mitting ambitions, again you may as well get a good pair, and be done with it.

The unit itself requires a valve and an audio-transformer.

As we have already said, almost any valve will do. The circuit we have shown uses a triode, and a triode is the simplest to connect. So make sure your valve is a triode.

The actual characteristics of the valve don't matter, except that it is best to get one which uses the lowest possible battery drain. You can probably pick up a second-hand triode valve which shows good emission for a few shillings. A 2-volt valve is probably best, because it will no doubt work quite all right from a 1½-volt cell. The emission requirements are very low, and the filament, as a rule, doesn't have to be burning its full brilliance to give all that is required. If you want to buy a valve, some of the small 2-volt triodes should be O.K., such as the 30, PM1HL, etc. The 30 is extensively used in oscillator circuits with 1.5 volts, and is perfectly satisfactory.

The audio transformer can be almost anything at all, as long as the windings are O.K. There are plenty of old types available round the town for a few shillings, and practically any of these will serve. The Philips type as used in our particular model is a very good one, and maybe you will find some other use for it some time later on. Its characteristics aren't so bad at all.

The transformer acts as the coupling coil, the grid circuit being wired to the secondary and the plate or feed-back circuit to the primary.

The same connections should be used as marked on the transformer—that is, P to plate and G to grid, etc.

If you should find that nothing happens with this connection, you can try reversing one of the windings, but not both. Use whichever connection gives results, as one of them won't.

CONSTRUCTION

The construction of the unit is so absurdly simple that no one could possibly go wrong. We have drawn out the circuit and also the actual connections to scale, to guide you when wiring up.

Our base measured 5 x 3½ x 1¼ inches, made of aluminium. You can get this base cut for you, ready folded, or you can carve out the hole for the four-pin socket with a 1¼-inch wood bit lubricated with some machine oil. Drill the three holes first—two for the mounting bolts and one in the centre to start the bit—as it's easier to get them accurately in place before the hole is cut. Price's Radio specialise in such chassis.

The four terminals must not touch the metal base. The easiest way is to use the insulated type, which will mount straight to the aluminium. In our model we drilled out holes to clear the shank of the terminals, and mounted them with two strips of bakelite which we had handy. Any mounting method will serve which insulates the terminals from the metal. This is very important.

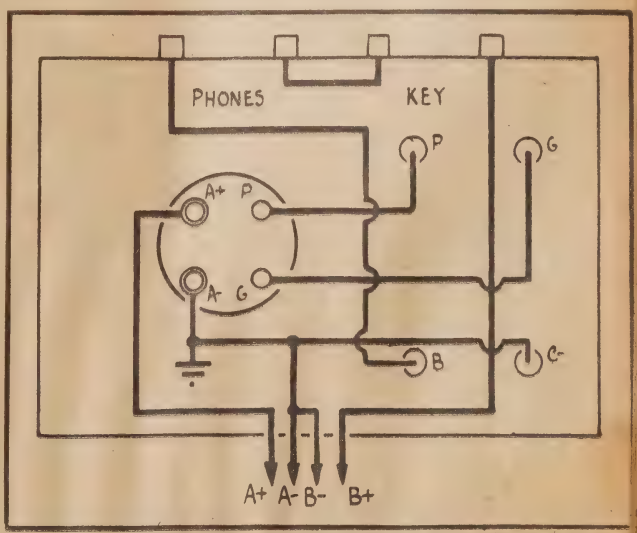
The battery leads run through the back of the chassis. Ordinary hook-up wire is used for all connections and leads. You will notice that the A minus and B minus are both connected straight to the chassis. The other two run, one to the positive of the A battery and the other to the positive of the B battery.

Don't put them the wrong way round. It's a good plan always to connect the A battery first. If you can see the filament alight, you know you are right. A switch can, of course, be fitted if you so desire. In fact, the whole unit could be placed in a box, batteries and all.

BATTERIES

Which brings us to the batteries themselves. The A battery can be an ordinary standard 1.5 volt dry cell of the larger type. It will last a very long time, although smaller batteries will be suitable over a shorter period.

The B battery may be anything between about 9 volts to 45 volts. The higher voltage will give a louder signal and make certain that the valve will oscillate readily and strongly. A light duty type is quite all right, as the drain is particularly low.



The wiring of the unit takes only a few minutes. A-minus is earthed to the chassis via a solder lug screwed under a bolt which holds the valve socket in place.

About ULTRA-SHORT WAVE TRANSMITTERS

the use of 5 meters and below

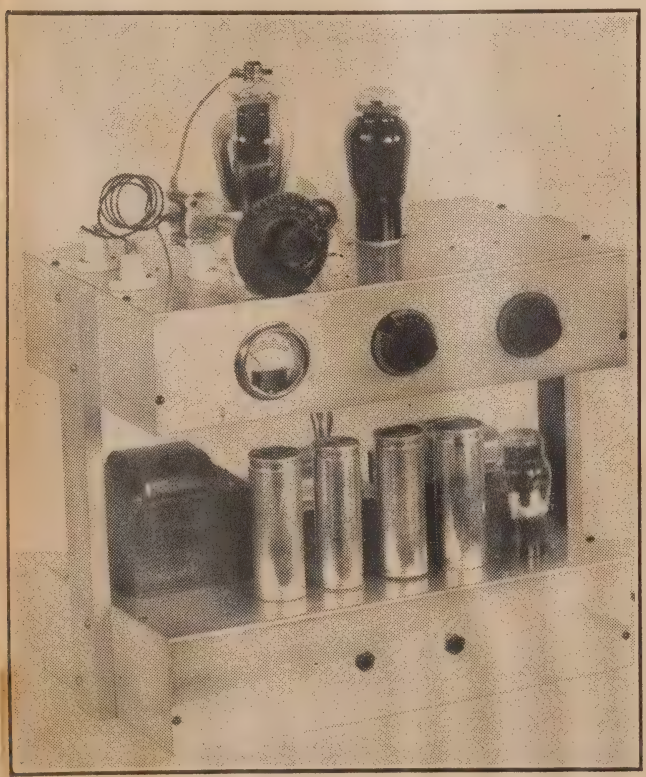
Here is the answer to many an amateur's prayers, for some transmitter he can afford on 5-meters. The circuit is exactly the same type which he has been using on other bands, and it will handle well over 50 watts input, modulated, without any trouble. Although using an E.C.O., reports indicate that the signals are steady, have negligible drift, and are almost entirely free from any frequency modulation.

By
JOHN MOYLE
(VK2JU)

N last month's issue, we published the description of a simple 5-meter converter for the reception of signals on this ultra-high-frequency nd.

In that article, we mentioned that hoped to describe a simple 5-meter ansmitter in an early issue—someing which would be so simple, and so expensive, that anyone could afford to build it, and to explore this interesting band.

Since then, we have put many hours of work into the job which is pictured on these pages, hours which have been repaid with very gratifying success. Our little transmitter has proved itself to have a sting rather more powerful than we had expected, and right from the word go has packed a wallop which commands respect.



A front view of the transmitter. Both chassis measure 15 x 9 x 3½ inches. Wooden supports are screwed to the wooden ends in the two chassis.

THE PROBLEM

As we have stated repeatedly, one reason why 5-meters has been denied to many is the difficulty which has existed in getting apparatus to work on that band without resorting to a long chain of doublers and amplifiers, running into great expense and complication.

In America, the position isn't so bad, for 10-meter crystals are obtainable quite cheaply, which allow crystal controlled transmitters to be made without much trouble. Such crystals are obtainable here, but few amateurs consider the cost worth while, as they are only suitable for use in ultra-high transmitters.

The trouble with 5-meters is that it is essentially a local band. It doesn't matter how many arguments you c put forward as to why other band shouldn't be used for local work, whe 5-meters is available. And of the ne cessity for amateurs to populate -no bands lest they should be t No arguments such as this come the lack of finance to ru rate, big transmitter, just for of 5-meter work.

THE SOLUTION

At any rate, that is how whole situation. And, despi there are dozens of fellow willingly give 5-meters a tri could find some way of ge without wrecking a perfectly g mitter built for other bands.

The heart of the matter see on the fact that nowadays n teurs realise the necessity f transmitters as against the o lated oscillators. Better rece convertors are making it har ceive badly frequency-modula ceivers. Before long, the ma a poor transmitter won't stand chance of being heard on 5-meters,

better gear gets round. That's rapidly getting to be the case now. And there is no question that the superhet will win out every time against the super-regenerative type.

Now, up till the present time, a stable transmitter has been regarded generally as being the same thing as a crystal controlled transmitter. Thinking round the matter, we couldn't help wondering what would be wrong with a good M.O.P.A. transmitter, if we could get away from all but the smallest percentage of frequency modulation, and keep the frequency itself as stable as possible.

Thinking still further, it was obvious that a small amount of frequency drift in itself isn't really objectionable—merely entailing slight retuning of the receiver as the transmitter at the other end warms up.

The real reason why modulated oscillators can't be received decently on selective receivers is because of the frequency modulation which occurs during transmission.

Get rid of that, maintaining as clear and steady a note as possible, and we would be getting somewhere.

THE M.O.P.A.

Thus we set out to build an oscillator-amplifier transmitter, of two valves, which would conform to these requirements.

Strangely enough, we couldn't find any serious attempt at solving the problem this way, in any of the well-known amateur authorities locally or overseas. Five and six valve rigs there were in plenty, but none which would serve the purpose.

So, thinking round the matter, we built up a job consisting of a 6L6G oscillating in 10 meters, and doubling to 5 meters, driving an 809 as an amplifier. This transmitter is described here.

THE OSCILLATOR

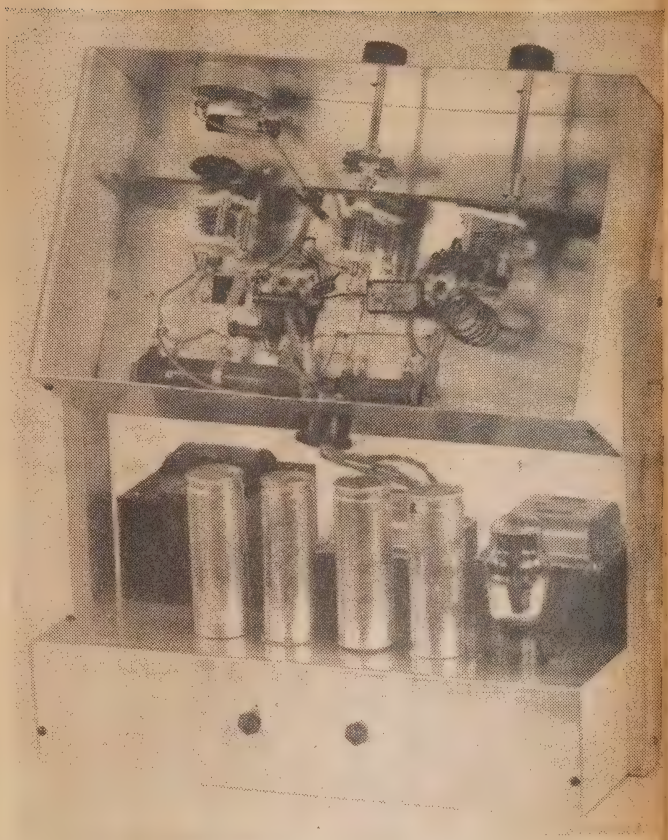
The choice of the oscillator fell almost automatically on the 6L6G. Our requirements were simply as much output as we could get from a valve doubling to 5 meters. No other valve except the 807 looked a possibility, and we wanted to keep to valves which might already be in an existing transmitter. Everyone has a 6L6G somewhere, and have already proved how they can be punished, if necessary. Again the 807, with its plate at the top, didn't suit our layout.

We already expressed our dislike of the main of trick circuits using re-action, we decided to try out the straightforward arrangements, which had been so successful on the other bands. We argued that the simpler the job, the better. We went an ordinary electron-coupled oscillator, just the same as was used, sometimes is to-day, on the other bands.

To be on the safe side, we kept to what would be considered plenty of C in the tuned anode or grid circuit, for best stability, and the thing wired up, and started to test.

There was no trouble at all in getting the thing to work. With 550 volts on the plate and 200 volts on the screen, we had no trouble at all in blowing out the amateur's favorite R.F. indicator, a penny pea-lamp. As far as we could see, there were simply lashings of power to be had in the 5-meter plate circuit.

Testing the stability by beating against a harmonic overtone in a 20-meter receiver showed that, although the note seemed a little rougher than crystal, the stability was quite good. The frequency creep was small enough to make it very optimistic.



Another view of the transmitter showing how the top chassis may be rotated for quick alterations when lining-up. Not a bad idea for any small transmitter. Power cable plugs in at the back.

PARTS LIST

5 METER TRANSMITTER

1 Chassis, 15 x 9 x 3½.
3 25 mmfds. double-spaced midgets.
1 50 or 100 mmfds. condenser.
3 50,000 ohm 2 watt resistors.
1 5000 ohms 20 watt resistor (with tap).
1 2500 ohms 5 watt resistor.
1 50 ohms. C.T. filament resistor.
3 .01 mica condensers.
2 .001 mica condensers.
1 .0001 mica condenser.
Gauge 14 enamelled wire for coils and wiring.
Bakelite strip, 7in. x 3in. x 1-8in.
Neutralising condenser (see article).
Sockets—1 octal, 2 4-pin.
Meter jacks, dials, hook-up wire, coil bases (see article), etc.

POWER SUPPLY

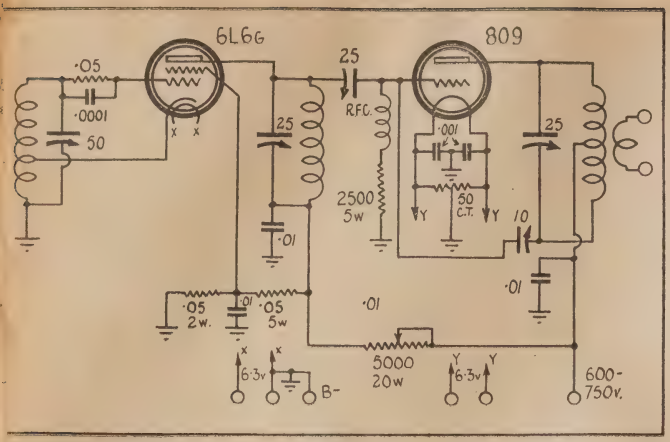
1 Base, 15 x 9 x 3.
1 Power transformer, 750-600-0-600-750 volts at 200 mills. (Henderson).
1 Filament transformer, 5v. at 3 amps., 2 windings—6.3v. at 5 amps.
1 200 mills filter choke.
4 600 v. electrolytics.
2 Power switches. Valve—1 5Z3.
Sockets—2 4-pin. Hook-up wire, etc.

THE AMPLIFIER STAGE

Having proceeded thus far, we h look round for a good power ampli

The obvious choice was an 6L6G. No doubt but there was p of drive available for it. It se easy money.

But a little thought made us p In the first place, it would pro need to be neutralised. Have you tried neutralising a 6L6? Seco no matter how we drove it, there definite limits to the output from a valve. We had in mind the 50 limit at least, with a possibility of higher if permits were to be ha



The circuit is almost identical with the 40-20-10 metre transmitter recently described. Standard practice throughout.

...y probably are without trouble on ...neters.

...What, then, is the next step up? What ...ut the 809?

...xperience with this valve in a num... of transmitters has given us a great ...pect for its efficiency and robust... ...s. These valves can take a caning. ...ey aren't very hard to neutralise, ..., although they have disadvantages ... 5-meters which we needn't worry ...ut for the moment, we decided to ...e one a trial.

...o a power supply was built to give ... and 750 volts at 200 mills, a voltage divider network installed to feed the 6L6G, and a power stage designed and added.

PERFORMANCE

To cut a long story short, we received several kinds of a shock when the thing was finally tamed. Starting with 600 volts on the plate, it became obvious that there was considerable R.F. floating round in the plate circuit. Bumping the voltage to 750 gave plenty more. After endless experiments with driving hook-ups from the 6L6G, we finally decided on the simple capacity method, tuned up the transmitter, and made some measurements.

Working on the C.W. conditions with 2500 ohms as a grid leak for the 809, and no R.F. choke, we found it possible, by careful adjustment, to get a grid current between 25 and 30 mills for the 809.

The minimum plate current was round about 50 mills unloaded, and out of resonance, it swung to over 200 mills. This was sufficient indication that our final results would be good.

On connecting an ordinary half-wave doublet, with twisted pair feeders, we found it possible to load the 809 to about 125 mills with the full voltage, and no color showing on the plate. That's an input of about 90 odd watts. The feeder current was sufficient to confirm these most excellent figures.

In other words, here we were with figures which are more or less comparable with, say, 20-metre operation (except for minimum plate current) from a two-stage 5-meter transmitter.

UNDER MODULATION

According to the maker's figures, and our own experience, the 2500 ohms bias resistor is a bit low for phone work, so we increased it to 5000 ohms. However, as would be expected, the extra loss in the resistor reduced our output, and we decided to try the effect of modulating with the lower value of bias resistor.

The modulator was the same job as described in the May issue, for use with the two-stage crystal controlled transmitter, almost identical with the one we had built for 5-meters.

We found no difficulty in modulating the full input to the 809 with excellent results, using only a 2500 ohms bias resistor. The plate current under these conditions remained almost perfectly steady, indicating that the R.F. drive was just sufficient to do the job nicely.

Reducing the input by loosening aerial coupling gave what appeared to be almost perfect modulation characteristics, providing, of course, that the right load was reflected into the modulator through the tappings on the modulation transformer.

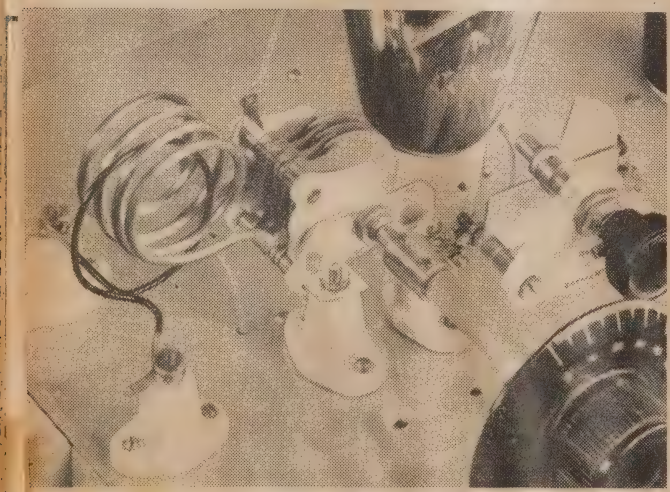
ON THE AIR

Having adjusted things to our satisfaction, we put the transmitter on the air and called C.Q. Most of the 5-meter enthusiasts have heard the transmitter by this time, and so far the poorest report has been R8. Even stations on the other side of the Harbor from Chatswood, where in the old days, on a good aerial, our best report was about R4, gave reports of up to R max. And the aerial we were using was a particularly poor affair, in a poor location.

At first we were troubled with a rough T6 or 7 note, and considerable frequency modulation. We discovered that the roughness was due to too high 6L6G screen voltage, and the frequency modulation to too close coupling between the oscillator and amplifier. An hour or two playing round with these adjustments resulted in amended reports with signal strength just as strong,

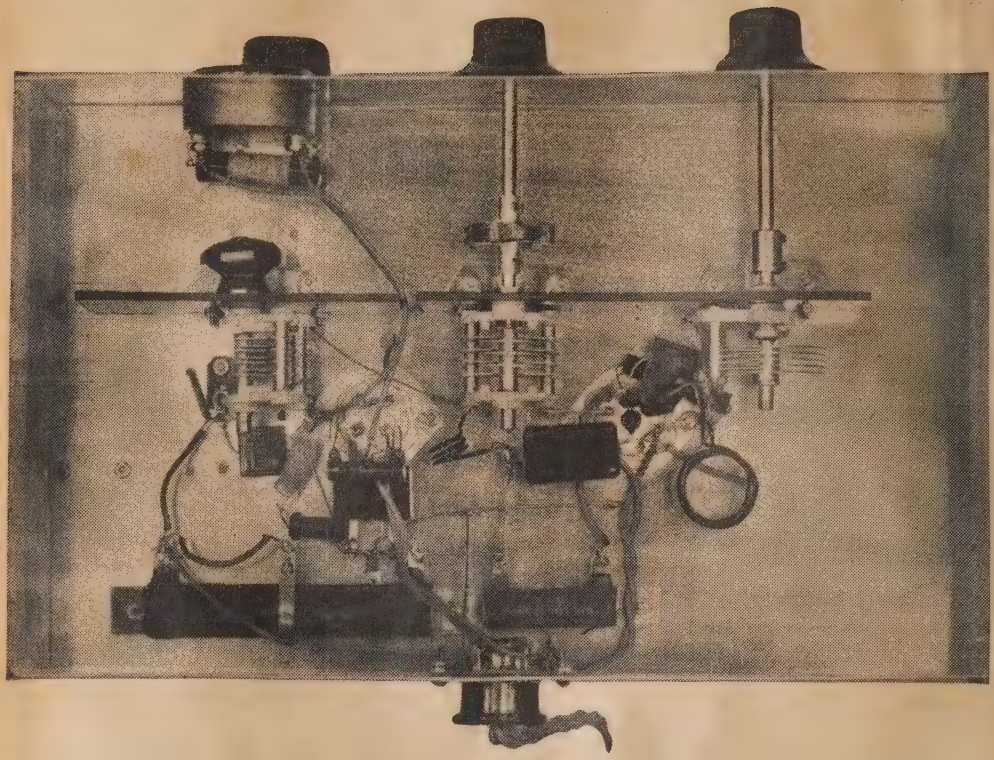
(Continued on Page 42)

FINAL TANK ASSEMBLY



...close-up of the final stage. Note the direct mounting of neutralising and tank ...densers. Tank coil mounts directly to the final tuning condenser. Note lead to the ... running down from the rotor of the neutralising condenser. Also H. T. lead from ...tre-tapped coil. Tuning condenser mounted on small aluminium bracket. Use good insulating rod for extension shaft.

UNDER THE TRANSMITTER CHASSIS



Under the chassis. At left is the 6L6G grid tuning circuit. Coil tapped one-half turn from earth end for cathode connection. Don't tap much further than this—slight variation is O.K. Grid leak and condenser immediately below it. Plate tuning for 5 meters in the centre—note the 3-turn plate coil. Then come variable coupling condenser all-in. Note R.F. choke and grid leak behind it. Wire-wound resistors located at the back for feeding 6L6G. Ground all bypass points to same spot for each circuit, keeping leads short. Separate filament windings are essential. Condensers mounted on good bakelite strip. Grid coupling condenser may be nearer the centre if desired to shorten leads.

almost crystal-clean carrier, and equency modulation almost entirely sent.

In other words, a signal which could sily be copied by the most selective meter superhets.

At this setting, neither valve appeared be showing the slightest distress and no time does the 809 plate show y color.

If we dare admit it, we have drawn om the unloaded tank circuit, with an dinary pencil, a flame about half an ch long. Don't repeat it, but it's a ct, as several who have seen the ansmitter working will testify!

Summing up, it seemed fairly clear at our ideal of producing a simple cuit for a simple 5-meter transmit-, using valves which most people ve, which will work with a power pply and modulator which again many nateurs already use, and which would ve a thoroughly satisfactory signal, s reached.

OSCILLATOR DETAILS

Concerning the oscillator circuit in detail, we commence with a 10-meter grid circuit using 5 turns of 13 gauge wire, spaced about two diameters, and tuned with a 100 mmfs. midget condenser about one-third to one-half in mesh. This seems to be enough capacity for stability, and good output. Grid leak and condenser 50,000 ohms, and .0001 mfds.

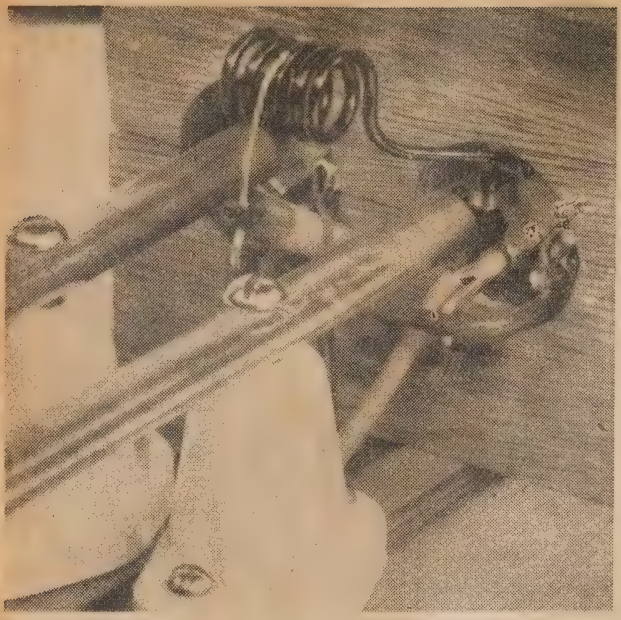
The plate circuit when loaded used 3 turns of the same wire, spaced about one diameter and tuned with a 2 mmfds. condenser again about one-third in mesh. You will have to adjust this coil by opening or closing spacing, till you strike loaded resonance with this adjustment.

The plate is fed through a 5000 ohm wire-wound resistor with a tap, so that the maximum plate voltage is 550 volts

TYPICAL OPERATING CONDITIONS

Although we have given in the article maximum figures obtainable from this transmitter, considerable care is needed to achieve inputs of 80-100 watts without shortening the life of the valves.

Here are a set of operating conditions within the maker's specifications, which you will have no trouble at all in obtaining, and which are perfectly safe as as the valves are concerned. Oscillator Plate Voltage, 550; screen voltage, 200; plate cathode current, 75 mills under load. Final 809 unloaded plate current in resonance 35 mills. Out of resonance 140 mills. Loaded current 80 mills. Plate voltage 600. Unmodulated 750 volts. We recommend this set of operating conditions as within the capabilities of the valves. Plate and screen dropping resistors should be adjusted to give these voltages for the 6L6G. Approximately 1000 ohms plate, and 20,000 ohms screen resistors are suggested as minimums. Plenty of experiment is allowable.



A close-up of the 2½ meter transmitter showing coil and long-line construction. See text for details.

The screen is fed through a 50,000 ms resistor from this 550 volt point, d another 50,000 ohms runs to earth. ese can be both 5-watt resistors. The een voltage you will find about right th these values, approximately 200 lts.

OUPLING TO 809

After considerable experiment, we und the best value of coupling con-nser to the 809 grid was 25 mmfds. nk coupling meant another tuning it, and almost impossible adjust-ent, as the 6L6G tank coil require-nts will vary considerably accord-g to the load. Unloaded, six turns would be nearer the mark to strike resonance.

You can experiment here ad. lib., but we found a variable 25mmfds. condenser ideal for adjusting the loading for best output and good results. We use the full-in adjustment.

THE 809 CIRCUIT

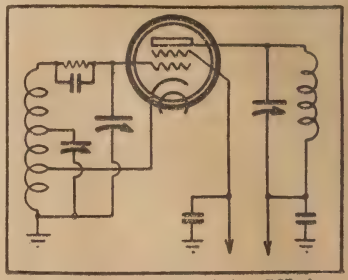
Up through the chassis comes a lead to the end of the neutralising condenser rotor. This condenser is so placed that this lead is as short as possible. The N.C. is about 15 mmfs., approximately 10 of which are used.

The final tank circuit uses a single 25 mmfds tuning condenser with the coil connected right across it. It is centre-tapped for neutralising, and the B plus lead drops straight through the chassis out of the way.

The close-up will show that the N.C. is connected right on the lug of the plate tuning condenser, three stand-offs supporting the whole assembly. Nothing could have shorter leads than this.

The aerial is coupled with a single-turn link supported on two more stand-offs, and bent to move between turns of the tank coil without touching!

This latter has four turns of 1-8 inch copper tube, spaced as shown, and about



This circuit is suggested by QST for vernier control of an E.C.O. The condenser right across the coil is the main tuner, which may be mounted under the chassis, and left set. The smaller one may be of about 15 mmfds., controlled from the front panel, and is useful when frequency change is required.

1⅛ inches in diameter. The tuning condenser is fairly well out of mesh to hit resonance.

The mmfds. condensers we had specially made up, with Trolitol ends, and double spacing. These are now on the market. All mounting details are found from the photographs.

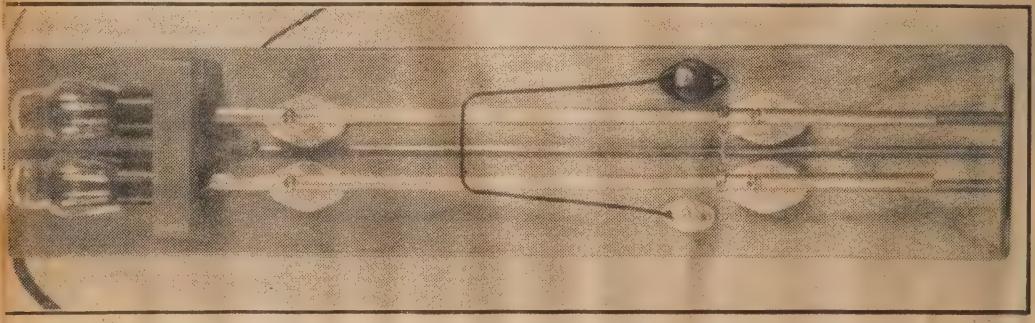
The R.F. choke, which really isn't essential, is made with 30 turns of 26-gauge wire wound on ¼-inch former, and allowed to hang in air.

CONSTRUCTIONAL POINTS

We draw attention to the fact that

(Continued on Page Seventy-five)

A SIMPLE TRANSMITTER FOR 2½ METERS



The 2½-meter transmitter. The construction is extremely simple. Note the "hair-pin" aerial coupler which is adjusted for right degree of plate current. The jumper is almost at the spot where the end pair of stand-offs are located. H.T. lead is connected to it, and runs under the base-board.

the "works" are mounted under that chassis on a bakelite strip, so that they are well out on their own, and are controlled with extension shafts, preferably made of good insulating rod. The same applied to the final tank control.

Note also that by strategically placing the screws which hold the wooden-ended top chassis in place it is possible by loosening one on each side to swivel the whole thing round, so that you don't have to pull it to pieces each time adjustments are required. Make sure the chassis clears the power supply, and the transmitter can be operated in this position for testing.

If you wire a meter shunted to read about 150 mills, in the filament centre-top of the 809, you can read grid and plate currents with the same connection. This is very handy in practice.

NEUTRALISING

It is possible to neutralise the transmitter almost perfectly—so close that any regeneration helps rather than hinders. There is no tendency for the 809 to oscillate without drive, when properly adjusted. Neutralising is carried out in the usual manner.

Use the best components wherever you can, and return all bypass points for each stage to the same point. Then connect all earthing points together with some of the 13-gauge wire, and earth all to the B negative lug on the power socket. This is quite important to avoid unwanted eddy currents. Make your chassis of aluminium or copper—don't use steel.

Get your measurements for layout from the large photograph, which we have provided in place of a rather difficult wiring diagram.

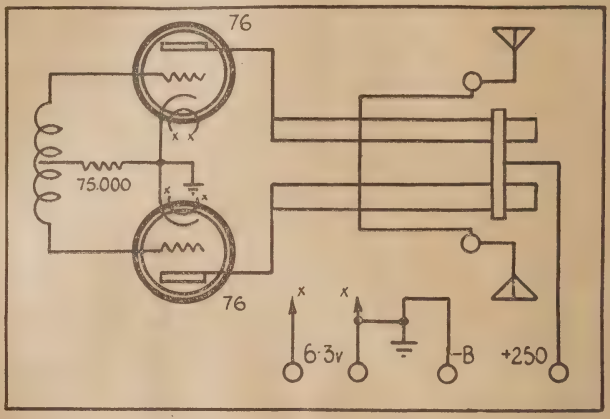
TWO AND A HALF METERS

Leaving 5-meters for a moment, let us say something about 2½-meters. This is not actually a band at the moment, although it will be after September 1. Permission from the R.I. must be obtained before that date, to experiment on this band, but this should be forthcoming to anyone really interested.

For real beginners, who are still at the modulated oscillator stage, we can't see any reason why such equipment should not be used in an endeavor to find something about this little-known band.

We are showing here a transmitter which we have built up for 2½-meters, and which has proved very satisfactory. It will give plenty of R.F. output on 250 volts, and has a surprisingly stable and clean signal.

2½ METER CIRCUIT



The circuit of the 2½ meter transmitter is the essence of simplicity. Check it against the photographs. You will note the fixed grid coil, which is sprung in and out to give the unloaded reading of about 50 mills at 250 volts. About 75 mills total is the maximum plate current which should be drawn for good valve life.

This circuit appeared in a recent issue of the American journal, "Radio," but it is a standard affair for all that.

The valves are 76's (or 56's), in a push-pull oscillator circuit, using "long lines" for the plate circuit, instead of a coil. This idea is familiar to most of us, who used it on 5-meters some years ago. It is much to be preferred to the tuned-grid-tuned-plate hook-ups.

A close-up photograph shows how it is built. The valve sockets are of Steatite, and are cramped between two wooded supports which hold them so that the valves are horizontally mounted. The grid coil is connected right from grid to grid pin, and from the centre the grid leak runs to the cathode, which is earthed to the B minus terminal.

The tubing is about 3ft. long, and of ¼in. diameter. It is supported as shown on stand-off insulators. A jumper is provided which can be slid up and down the tubes for tuning.

The grid coil is squeezed in or out

(Continued on Page 75)

LAST MONTH'S CONVERTER

Very few designs are incapable of improvement by anyone interested enough to put the time and trouble into such experiments. As indicated last month, we have been playing round with our 5 meter converter, and have been able to get even better results by making the following changes.

Having further opportunities to chase the weaker stations on the air, we have improved the sensitivity of the converter by increasing the oscillator plate voltage. Whether individual 6K8G valves vary in their characteristics is not quite clear, but evidence points to the fact that this is the case.

Anyhow, reducing the oscillator plate-dropping resistor to 25,000 ohms will in most cases, give a better gain on weak signals. Noise level will probably come up a little, but the signal will come up more than the noise.

Reducing the bias resistor to 150 ohms was also a good move with our converter, although this may not be so with every 6K8G. Experiment with this.

SCREEN VOLTAGE

Feeding both screen and oscillator plate through the same resistor of 15,000 ohms, as advised for the higher wavelengths, will probably result in uncontrollable oscillation in the pentode circuit, even with the aerial tuning circuit heavily loaded. No change was found beneficial from the present dropping resistor of 50,000 ohms. It may be possible even to reduce this slightly, with improvement.

GRID TUNING COIL

A better L/C ratio will be obtained in the grid tuning circuit by increasing the coil to 9 or 10 turns of the same wire and diameter—14 gauge and ¼ inch. A larger aerial coupling coil of about 7 turns might also be found beneficial, and experiment with the degree of coupling will be worth while.

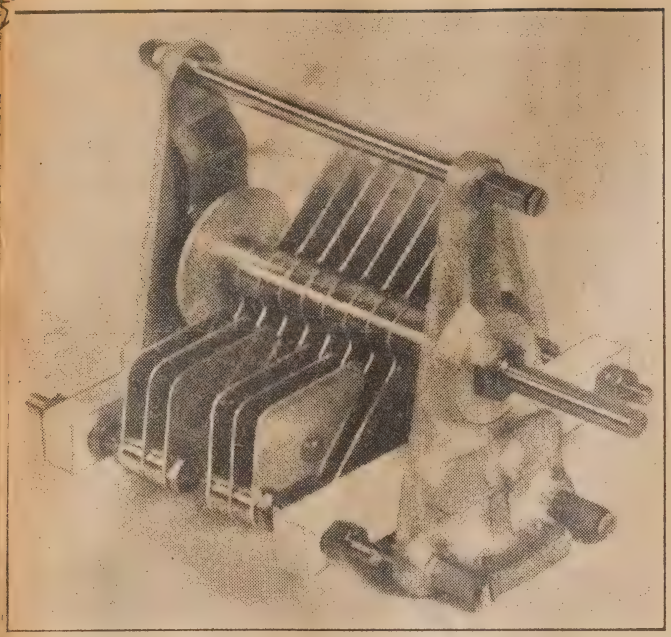
If you couple too tightly, you may lose the sharpness of the peak in tuning this circuit, and sensitivity will drop as a result.

The use of the transmitting aerial for reception is strongly advised. Most stations used vertically polarised aerials, and a vertical receiving aerial will make all the difference, in most cases. Height is the most important factor.

THE RECEIVER

It is important that the receiver used with the converter is free from instability in the first stage. If there is a tendency to oscillate, this will be reflected into the plate circuit of the converter, with drastic results. It will usually be found that all gain controls on the receiver, if of any size, can be turned well back without sacrificing usable signal strength.

With the adjustment outlined above, the converter has proved exceptionally sensitive, and easy to handle.



RAYMART CONDENSERS

A NEW line of transmitting condensers has been landed by John Martin—new in the sense that these are the first full-sized transmitting condensers in the famous Raymart brand which have been made available.

Our illustration shows clearly the rugged nature of the condensers. The ends are made of cast aluminium to prevent possibility of warping or damage, which would cause loss of alignment.

The plates are well made and finished, and solidly mounted on bolts which run through to the strips of insulating material. This is the same high quality material used in all Raymart condensers. The insulation blocks are made fast to the end plates.

Note the heavy wiping contact plate for the rotor.

Three sizes are available, in types suitable for both small and big transmitters. The condenser shown here is a split stator type, but single-ended condensers in all capacities are also available.

Round the Trade

NEWS AND NEW RELEASES

PHILIPS DESIGN ELECTRIC MEGAPHONE

COMBINED SPEAKER AND MIKE

RECENTLY Philips have succeeded in designing an electric megaphone, as simple and convenient as one of the non-electrical kind.

The apparatus consists of a celluloid horn fitted to a small and very sensitive speaker. By means of a rubber intermediate piece a small carbon microphone is mounted on the speaker casing.

This is the first time in the history of amplifier engineering, according to Philips, that microphone and speaker have been combined into one instrument in which provision is made for microphonic effect.

The electric megaphone, called the "Portaphone" amplifier, is completed by a portable amplifier which is housed with its feed batteries in a leather case that can be carried over the shoulder, by means of a strap or in the hand.

In order to prevent waste of power, the megaphone is provided with a handle-switch with which the amplifier is switched on only during speech.

In the open air, with normal speaking, excellent intelligibility is obtained at a distance of no less than 250 yards. The volume of sound is so great that in enclosed rooms the megaphone has to be switched to a lower power.

The uses that this new invention may be put to are very numerous. On sports grounds, for the police and fire brigade, for tourist guides, for shipping and many other purposes the

"Portaphone" amplifier will render excellent service.

Philips Lamps (A/asia), Pty., Ltd., wish to state that those interested in this new line may obtain further information by applying to the Industrial Department, Clarence-street, Sydney.

LATEST AMPLION PRODUCTION

Speakers feature impregnated transformers which eliminate breakdowns.

ADVICE is to hand from Amplion (A/sia), Pty. Limited, concerning a new complete range of loud speakers for 1939.

All the speakers have been improved in some form or other, featuring electric welding, insulated core transformer, socket fitted on speaker with spare plug, &c.

In view of the changes, all the speakers have been given a new designation, and externally, it will be noticed that they all now are sprayed "Amplion Iridescent Grey."

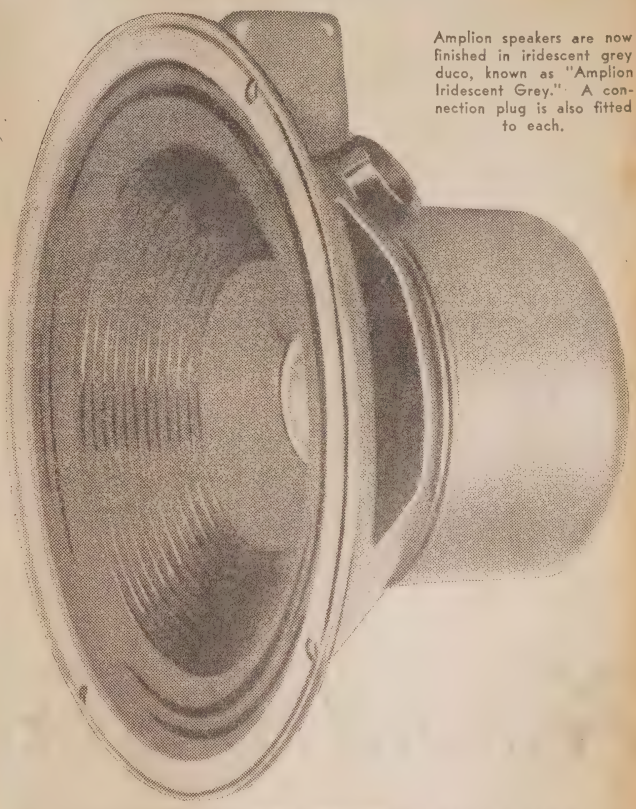
The types and new designations are shown hereunder:—

Model	Type
M	5in. Electro magnet.
MP	5in. Permag.
Y	6in. Electro magnet
YP	6in. Permag.
X	8in. Electro magnet
XP	8in. Permag.
V	12in Electro magnet, standard.
VL	12in. Electro magnet, de luxe.
VP1	12in. Permag., standard.
VP2	12in. Permag., de luxe.
VP3	12in. Permag. Power.

In addition to insulated core transformers, these are also impregnated. Amplion claim that break down now, instead of being an improbability, is an impossibility.

They also feature a socket fitted to speaker, on which the leads from the field coil and transformer terminate. A spare plug is supplied with the speaker, to match the socket. This practice, they claim, will become a standard in Australia very shortly.

A very comprehensive publication, No. 88, was sent to us, which they will gladly forward upon application.



Amplion speakers are now finished in iridescent grey duco, known as "Amplion Iridescent Grey." A connection plug is also fitted to each.

THE NEW AMPLION SPEAKER

FEATURING WELDED HOUSING

KEN-RAD ANNOUNCE 1.4 VOLT BEAM VALVE

STOCKS WILL BE HERE SHORTLY

FURTHER technical details of the Ken-rad valve type 1Q5G, are to hand from E.T.C. Industries Ltd., who also announce that stocks will shortly be available. The 1Q5G is a beam power output valve designed for applications requiring high efficiency and low distortion. The 1Q5G is a glass tube equipped with an octal base.

The power sensitivity of the 1Q5G is approximately twice that of the 1C5G, this being a big factor in improving performance in the 1.4 type receiver. Putting the Control Grid Voltage of the 1Q5G up to -6 volts, current consumption is reduced to the level of that of the 1C5G, while the harmonic content is still lower than the 1C5G.

Compared with the 1C5G, characteristics are:—

1Q5G		1C5G
1.4v. D.C.	Filament Voltage	1.4v. D.C.
.100 amp.	Filament Current	.100 amp.
90	Plate Voltage	90
90	Screen Voltage	90
-4.5	Control Grid Voltage	-7.5
9.5 m.a.	Plate Current	7.5 m.a.
1.6 m.a.	Screen Current	1.6 m.a.
2,100 micromhos	Mutual Conductance	1,550 micromhos
8,000 ohms	Load Resistance	8,000 ohms
.27 watt	Power Output	.24
7½ p.c.	Total harmonic distortion	10 p.c.

S. W. TUNING CHART

13 Metres.

No stations now audible at entertainment level.

☆

16 Metres

GSV, London, 16.84m., 11.0 p.m. till midnight.
DJH, Berlin, 16.81m., 11.0 p.m. till midnight.
W2XE, New York, 16.83m., 9.30 p.m. onwards.

☆

19 Metres

GSP, Daventry, 19.6m., 7.20 a.m. till 9.0 a.m.
GSO, Daventry, 19.76m., 7.20 a.m. till 9.0 a.m.
DJR, Berlin, 19.56m., 7.50 a.m. onwards.
DJB, Berlin, 19.74m., 7.50 a.m. onwards.
SBT, Motala, 19.79m., 6.30 a.m. till 7.15 a.m.
OIE, Lahti, 19.75m., 6.30 a.m. till 7.15 a.m.
2RO6, Rome, 19.61m., 6.30 a.m. till 8.0 a.m.

☆

25 Metres

GSD, Daventry, 25.53m., 3.0 p.m. till 5.0 p. m.
DJD, Berlin, 25.49m., 1.0 p.m. till 2.0 p.m.
RNE, Moscow, 25.0m., 7.0 a.m. onwards.
XGOY, Chungking, 25.21m., 9.0 p.m. (news 9.20 p.m.).
SBP, Motala, 25.63m., 6.30 a.m. till 7.15 a.m.
LKQ, Oslo, 25.57m., 6.0 a.m. till about 6.30 a.m.

☆

31 Metres

DJX, Berlin, 31.01m., 6.30 a.m. till 7.20 a.m.
2RO3, Rome, 31.13m., 6.0 a.m. till 8.0 a.m.
GSC, Daventry, 31.32m., 7.20 a.m. till 9.0 a.m.
DJN, Berlin, 31.45m., 7.50 a.m. till 9.0 a.m.
W6XBE, Treasure Island, 31.48m., 10.0 p.m. till 1.0 a.m.
GSB, Daventry, 31.55m., 3.0 p.m. till 5.15 p.m.
TAP, Ankara, 31.7m., 6.30 a.m. till 8.0 a.m.

☆

49 Metres.

MTCY, Hsinking, 48.98m., 11.30 p.m. onwards.
"RADIO SAIGON," 49.05m., 10.0 p.m. till 11.30 p.m.
CRY9, Macao, 49.18m., Mondays only, 11.30 p.m. onwards.
SBO, Motala, 49.46m., 7.15 a.m. onwards.
GSA, Daventry, 49.59m., 7.20 a.m. till 8.0 a.m.
ZHJ, Penang, 49.51m., 10.30 p.m. till 11.40 p.m.
YDA, Tanjong Priok, 49.6m., 10.0 p.m. onwards.
DJC, Berlin, 49.83m., 6.30 a.m. till 7.20 a.m.

OVERSEAS BROADCASTERS

WITHOUT searching for the elusive DX signals, which are the joy of the ardent short-wave listener, there are always plenty of real entertainment stations which come in at good strength on even moderately sensitive receivers. Chief among these are the following:—

DAVENTRY.—Breakfast time music and news at 7.30 a.m. can be received from either of the three transmitters in the 19 metre band, or else from GSC on 31.32 m., while later in the forenoon, GSO on 19.76 m., can be heard at good strength from 9.20 a.m. onwards. In the afternoons both the 19 m., 25 m., and 31 m. stations are also well received.

GERMANY.—Perhaps one of the best German stations at the present time is DJX on 31.01 m. around 7.0 a.m., but good signals are also heard from DJC in the 49 metre band at the same time. At night DJH on 16.81 m. is still putting in the loudest signal on this band, while if the 19 metre band holds good for any length of time, excellent reception will also be obtained from these stations.

U.S.A.—The Treasure Island station, W6XBE, on 31.48 m., is still the best American, and is heard at great strength from opening at 10.0 p.m. Their news service at 10.30 p.m. is among the best on the air, covering both world and domestic events, which are really right up to the minute.

ITALY.—The Italians still give us excellent musical fare in the early mornings, and on some occasions well into the fore noon. Both 2RO3 on 31.13 m. and 2RO6 on 19.61 m., are coming in very nicely, and judging by the announcers' remarks, they are anxious to hear from all listeners as to how they enjoy the programmes.

PHILIPPINE ISLANDS.—From Manila we now have the choice of three stations every night, KZHS, KZRM, and KZIB, all on the 31 metre band. Entertainment of a very diversified class can always be heard from these stations.

CHINA.—Despite the troubled conditions in this country, they appear to be concentrating on enlarging their short wave outlets, and at the present time all the following stations are giving news bulletins in English: XGOY, XJOB, XPSA, and XMHA. We understand from our readers' reports that XGOX has been heard testing on 31 m., 32.1 m., and 49 m., so watch out for it on any of these wave lengths, in addition to its regular allocation in the 16 and 19 metre band.

FRANCE.—The French Government stations TPB11, on 19.83 m., has been heard at very good strength between 4.0 p.m. and 5.0 p.m., while TPA3 on 25.24 m. opens at 4.0 p.m. also, and is nearly as strong. During the forenoon one can also hear TPA2 on 19.68 m., but this one is not very strong. The French stations appear to be giving more frequent announcements in English.

THE MONTH ON SHORT WAVES

CONDUCTED BY RAY SIMPSON

KING AND QUEEN IN CANADA

THE THETIS DISASTER

During the past few weeks short-wave listeners have been able to hear first-hand information of two widely-different events—one triumph and the other tragedy.

We refer to the tour of Canada by the King and Queen, and the terrible disaster to the submarine Thetis.

On different days quite a number of rebroadcasts were heard of the various events in connection with the tour, and also very colorful descriptions of their Majesties' reception in the U.S.A. Judging by the noise of the crowds, their welcome in the United States was every bit as enthusiastic as it was in the Dominion.

Broadcasts of a very different character were given from the Empire stations during the unfortunately unsuccessful attempts to rescue the crew of the submarine Thetis.

Even at this distance, one could not help being impressed by the strained voice of the announcers, as they gave details of the rescue operations.

19 BAND REVIVAL

In direct contrast to last month, and we think to the surprise of most listeners, the 19-metre broadcast band has been really excellent, both in the early mornings, forenoon, and evening hours, being reminiscent of summer reception.

The 25-metre band, on the other hand, has been most disappointing, with only an occasional period of really good reception. A few loud stations are heard at different times, but taken on the whole the band is far from satisfactory for consistent reception.

The two Empire stations on the 13-metre band are still heard, but weakly, while 16 metres is still inconsistent, though at times it gives excellent reception late at night.

In our opinion the 31-metre stations are still the most reliable both in daylight and darkness. Unfortunately this band is becoming too popular for new broadcasters, as new stations are being squeezed in with only 5 kc separation, making reception very difficult.

The 49-metre band has never been very popular with listeners, due to the high noise level, but at the present time, especially in the early mornings, many stations can be heard at good strength.

Taken all in all it has been a good month, as many new stations have been logged, details of which are given elsewhere. According to overseas reports there are many more new stations which will shortly take the air, so an interesting time is ahead for all listeners.

In about a month's time we hope to have one of the latest American short-wave receivers at our receiving station, and if it lives up to its description, we should have some interesting times with it, as it tunes from five right up to the top of the broadcast band.

Good listening to all our readers, and please continue to send us your reports. The reception to our appeal has been very gratifying, and we trust that readers who have not as yet written will do so during the next month, and please remember to send reports to reach us not later than the 10th of the month.

NEW STATIONS

During the past month we were fortunate in logging a few new countries two of which we have not seen previously reported in Australia, though no difficulty should be experienced in logging them as they were at quite good strength on our receiver.

The first one was ZP8, on 9280 kcs. in Asuncion, Paraguay, which we first heard on Sunday, May 28, from just before 4.0 p.m. until they closed down at 4.30 p.m. The usual South American type of dance music was being given, with frequent announcements in Spanish.

On closing, a lengthy announcement was given by a male announcer, giving call and location. No closing tune or signals were used, so readers will have to rely on their knowledge of Spanish plus the accurate calibration of their receiver, in order to identify it. As a guide, it is practically on the same dial setting as LYR or XGX.

EPB—IRAN

The next one was EPB on 15.100 kcs in Teheran, Iran. We heard this on on three different occasions between 5.30 p.m. and 6.0 p.m., when they were calling London.

In addition to this transmitter, the Teheran authorities are also now carrying out tests from EQB, 6155 kcs, 48.7 m., and will shortly also use EQA, 8950 kcs, 33.53 m., and EQC, on 9680 kcs 30.99 m. Neither of these last three stations have been heard as yet in Australia, but as they will be using 20 kw power, they will probably be heard in the future.

TRIPOLITANIA

Another new country heard recently was Tripolitania, the station being ICK on 9460 kcs. It was heard at quite good strength until it closed down at 6.25 a.m. I think the programme actually originated in Rome, as it was the same as that being broadcast by the Ethiopian station, IABA. We understand that ICK also carries out telephone traffic with Rome daily, but we have never been fortunate enough to hear them. Verifications for these stations can be obtained only by sending reports to Rome, Italy

Yet another new country heard was French India, but as this was from an amateur station, FN1C, it does not come within the scope of these notes.

CORRECTION FOR BAGDAD

HNF IS ENTIRELY NEW STATION

IN last month's issue we listed the Bagdad station on 9850 kc as being Y15KG. (Readers will remember this was one of the original mystery stations carried forward from our first issue.) As we actually heard this call from the station, we naturally listed it as such, but it now appears that the correct call is HNF, and is an entirely new station, also located in Bagdad, and which relays Y15KG. We regret this slight error, but, as both stations are operated from the same source, and the address the same for both, Qasr-el-Zahoor Broadcasting Station, listeners should still receive their verifications, even though they are addressed to Y15KG.

SWEDEN HAS TWO NEW TRANSMITTERS

URUGUAY NOW HEARD—LISTEN FOR MTCY, MANCHUKUO—ALSO FOR FINLAND

A feature of the last few weeks has been the many new stations which have now become audible in this country. Some of them are entirely new, while others are older stations which have not been previously listed as being heard.

THE Swedish broadcasting authorities have recently put on the air two new transmitters, which now give them four active stations at he present time. The new ones re SBT, on 15.155 kc., which can e heard at very good strength very morning from about 6.0 until they lose down at 7.15, with an announcement in English to the effect hat they are then changing over to BU, on 9535 kc, and SBO, on 6060 kc. BU can be heard, but, as it is only 5 c away from W2XAF, it requires a elective receiver to separate them. In he first transmission, closing at 7.15 hey also use SBP, on 11,705 kc, hich is nearly as strong as SBT, in he 19-metre band.

URUGUAY

We advised listeners in last month's Flashes From Everywhere" to watch ut for CXA6, in Uruguay, and, as vents have proved, this was good adice, as we have now heard this station pening every morning at 6.30 on 9620 c with a news session in Spanish until bout 6.50, followed by organ and lassical music. It reaches a peak round 7.0, and, although all announcements are in Spanish, the call etters can easily be heard, CX6 and XA6. Address is Mercedes 823, Montevideo.

Changing again to this part of the world, we have the new Manila station, KZHS, on 9580 kc, which can be heard t various times from 8.0 p.m. till well fter midnight on some nights. Accordng to their announcements, they are a on-commercial station, and are carryng out tests on this frequency, and would ppreciate reports from all listeners which will be acknowledged both over he air and also by return mail. Their ddress is P.O. Box 119, Manila, Philipine Islands.

The Norwegian State Broadcasting Service is now also operating LKV on 15,170 kc, which we have heard on some nights, though it does not seem to e regularly on the air.

MANCHUKUO

On June 5 we logged a new station in Manchukuo, MTCY, on 6125 kc. They open at great strength at 11.30 p.m. with announcement in their own tongue, and then play music until about 11.45 when call is given in English, "MTCY, on 6125 kc, test transmission," and after this they give a news session in Russian which lasts until after midnight. No difficulty should be experienced in finding them, as they are just lower in wave-length than Radio Saigon, which now closes at 11.30 p.m. We understand the location is Hsinking.

PORT MORESBY

Another station which we have heard on quite a few early mornings around 7.0 is VHSU, in Port Moresby, Papua, which has been using a frequency of 6540 kc. They are usually conducting traffic with other New Guinea and Australian stations, and read the messages slowly, and, in some cases, spelling out the words. As these messages are private, it is quite possible they will not verify reports.

NEW PORTUGESE ON 41 METER BAND

Further evidence that the European broadcasters intend to make full use of the new 7200 to 7300 kc. band is shown by the arrival of a new Portugese transmitter CSW8 in Lisbon, which is now heard at excellent strength until closing at 8.0 a.m. A lady announcer gives very interesting talks on the attractions of Portugal as a holiday resort. The frequency is approximately 7260 kc, 41.3m., just slightly higher in wavelength than the Frenchman on 7280 kc., 41.21m., who is also on the air at the same ime.

FINLAND

On numerous mornings during the last few weeks we have heard the Finnish station, OIE, on 15,190 kc, from about 6.30 until after 7.0, when it is practically blotted out by GSO. Strength is very good, and it can be easily recognised by comparing the programme with OFD, on the 31-metre band. Both lady and gent. announcers are heard.

Two other stations which we have not personally heard before are SP19 and SP25, which can now be heard opening every morning at 9.0 with announcement in English, French, Spanish, and German. They also announced this morning that they were using SPW as well, but there was no sign of it on our receivers. SP19 is very much better than SP25, but they can both be followed.

FLASHES From EVERYWHERE

U.S.A.—Watch out for the new station in Boston, Mass., operated by the World Wide Broadcasting Corporation, which has started test transmissions on 11,730 kcs. and 15,130 kcs. The call-letters are W1XAR.

SENEGAL.—The French Government is now constructing a short-wave transmitter in Dakar, West Africa. As it will be of 10,000 watts power, it is quite possible it will be heard in this country.

FINLAND.—In order to cover the Olympic Games, which will be held in Finland next year, the government has ordered a 50,000 watt transmitter, which will be located at Pori.

POLAND.—According to advice just received from Polskie Radio, the present transmitters are only temporary, and will be withdrawn immediately the new powerful stations are completed, probably late this year.

YUGOSLAVIA.—This country is also building a new short-wave station, located at Zenum, and on completion will test in all the regular bands, including the 7200 kcs. to 7300 kcs. The present YUA will be retained as an additional outlet.

ST. KITTS.—When reception is good from the Cubans on the 49-metre band, keep a look-out for ZIZ, which transmits on 6385 kcs. Station is operated by the Carribbean Broadcasting Service.

HUNGARY.—Two new stations have recently been put on the air in Budapest, under the title of Radio Liberal. Their call-letters are HAAQ2, on 9625 kcs, and also HAAQ3, on 7221 kcs. So far, they have only been heard around noon E.A.S.T., which is not very suitable for reception. They are anxious to receive reports on these test transmissions.

JAPAN.—The Japanese authorities are reported to be now using two new stations irregularly, namely JVW on 7255 kcs, and also JVW2, on 9665 kcs. Incidentally, the one on 11,725 kcs. is JVW3 and not JZW3 as previously listed.

URUGUAY. — We understand that CXA2, of Montevideo, Uruguay, which now uses the 6002 kcs. channel, will shortly move to 9570 kcs, where it will be received very much better. This station rebroadcasts LS2 of Buenos Aires, and the address is Rio Negro, 1631, Montevideo, Uruguay.

GUADELOUPE.—The new station which has recently come into operation in this French colony, FG8AH, has recently changed its frequency to 7445 kcs., which removes it from the serious interference from the 40-metre amateurs. Announcements in English are given, and in case anyone hears it, the address is Andre Haan, Boite Postale 125, Pointe-a-Pitre, Guadeloupe, F.W.I.

SOUTH-WEST AFRICA.—An unauthorised short-wave station is operating in this country on the following 7140 kc., 9090 kc., and 10,710 kc.

ULTRA-HIGH FREQUENCIES

ONCE again the U.H.F. bands have been very changeable, which makes any definite forecast very problematical, but if last year can be taken as a guide we do not fancy these bands will improve to any great extent for a few months yet.

However, according to Dr. Gaden, of Queensland, the 11 metre stations are coming in there at real entertainment level, as he reports good reception from W6XKG, W8XNU, W4XA, and W2XQO, and probably by now has heard a few others as well.

At our location we have only heard one new one, in WQJF, the Chicago Police Department, on 31,100 kc, which came in at very good strength one Sunday forenoon.

We are now able to give the location of three of the police radios mentioned in last month's U.H.F. notes, which are as follow:—WQLJ, Racine, Wis.; WQXO, Juneau, Wis.; and KQDH, Amarillo, Tex.

The Crosley Radio Corp. of Cincinnati, Ohio, have now put a facsimile transmitter on the air which operates on 26,000 kc, under the call sign W8XUJ. Another new station on the 11 metre band is W2XVP, location unknown at present, but which is operating on 26,100 kc, with 1kw power.

Stations actually heard during the last month are as follow:—

W6XKG.—25,950 kc, Los Angeles, Cal.
W8XNU.—25,950 kc, Cincinnati, Ohio.
W9XTC.—26 050 kc, Minneapolis, Minn.
W9XJL.—26,100 kc, Superior, Wis.
W4XA.—26,150 kc, Nashville, Tenn.
W2XJI.—26,300 kc, New York, N.Y.
W9XA.—26,450 kc, Kansas City, Mo.
W2XQO.—26,550 kc, New York, N.Y.
W9XPD.—31,600 kc, St. Louis, Mo.
KQBR.—30,700 kc, Alemeda, Cal.
WQKB.—30,700 kc, Evansville, Ind.
WQJF.—31,100 kc, Chicago, Ill.
WQKC.—31,500 kc, New Rochelle, N.Y.
WQBL.—31,500 kc, San Gabriel, Cal.
KAOC.—31,460 kc, Wichita, Kan.
W6XI.—31,440 kc, San Francisco, Cal.

THE HOME OF BIG BEN

A fine picture of Big Ben which is so often heard from the Empire stations, giving the time to the world.

This Month's Verifications

ZAA.—Radio Tirana, Tirana, Albania. We were fortunate in receiving this one, as it was sent out only a few days before the recent political changes in this country. Their address at that time was Stasione Radiotelegrafik, ZAA, Direction du Poste, RTF, Tirana, Albania.

W4XA., Nashville, Tenn.—This station sent a very attractive card with call-letters superimposed on a sheet of music. Their power was 250 watts and frequency 31,600 kcs at the time of our reception, but they now use 1000 watts and operate on 26,150 kcs. They advised us that ours was their first report received from Australia.

W6XBE, Treasure Island, Cal.—We have just received our verification for this station's 31.48 m. transmission. They now send an attractive card, showing map of the world, with comparative times. We were interested to see by their card that our report was the first from Australia for this frequency, as it also was for their 19.56 m. transmission.

SP31, Warsaw, Poland.—The card from this station is a beauty in blue and white, with large call-letters, and station information, showing frequency 9525 kcs. and power 5 kw. This is only an experimental station, which is being used until the new Polish short-wave stations are finished. Address is Polskie Radio, 5 Mazowiecka-street, Warsaw.

SP48.—Same location. Another attractive card, with call-letters in a different shade of blue, 2¾ inches high! Same address as above and frequency 6140 kcs.

HVJ, Vatican City, Italy.—An interesting pictorial card is sent showing view of their antenna towers, and giving station information for their 11.74 kcs. outlet.

PO6ZA, Hollandia, Dutch New Guinea.—This verification took the form of a letter from their radio operator, verifying our reception of their U.H.F signals on 27,980 kcs. This was a very acceptable one, as it increased our list of countries verified to 110.

XMHA, Shanghai, China.—This station sent a plain but effective card showing call-letters and frequency of both their broadcast station and also the short-wave outlet. At the top is a Chinese jazz orchestra, which looks a trifle incongruous in an Oriental setting.

Listen for these!

OVERSEAS STATIONS NOW AUDIBLE

Here is a list of short-wave stations which have actualy been heard over the last few weeks. Most of these should be heard by any of our short-wave fans who have a good set and location. Details of each station are given, and when also reported by readers, their names appear in brackets.

ENGLAND

GSA.—6050k.c., Daventry, England. Used in the early morning session at 7.0 a.m., but not very loud.

GSB.—9510k.c., Daventry, England. One of the oldest and most popular of the Empire stations, always good in Trans. 1. (Keast), (Lee), (Gaden).

GSC.—9580k.c., Daventry, England. A real breakfast time one, being at excellent strength. (Lee), (K. Mc.).

GSD.—11,750k.c., Daventry, England. This is one of the best Empire stations, and is heard well in their various sessions.

GSE.—11,860k.c., Daventry, England. Comes in well in some places during the forenoon until about 11.0 a.m. (Gaden).

GSF.—15,140k.c., Daventry, England. Another very powerful signal in the 7.20 a.m. session, also Transmission No. 1. (Lee), (K. Mc.).

GSG.—17,790k.c., Daventry, England. Not quite so strong as the other Empire transmitter on the same band. (Lee), (Keast).

GSH.—21,470k.c., Daventry, England. The same remarks apply to this station.

GSI.—15,260k.c., Daventry, England. Used in the No. 1 Transmission. (Lee).

GSJ.—21,530k.c., Daventry, England. Only heard at very weak strength now, and probably not at all in some areas.

GSO.—15,180k.c., Daventry, England. This one is excellent strength, with the news session at 7.30 a.m. (Lee), (K. Mc.).

GSP.—15,310k.c., Daventry, England. Heard at very good strength in the early mornings, from 7.20. (Lee), (K. Mc.).

GSV.—17,810k.c., Daventry, England. Still heard with a good signal at 11.0 p.m. (Lee), (Keast).

GRX.—9690k.c., Daventry, England. This new transmitter is heard every morning at 7.0 with their broadcast for European countries, but is not very strong. (Keast).

GERMANY

DJA.—9560k.c., Berlin, Germany. Very often heard at good entertainment level in the early afternoon. (Lee), (Keast).

DJB.—15.200k.c., Berlin, Germany. One of the loudest Germans on the 19-metre band. (Lee), (K.Mc.).

DJC.—6020k.c., Berlin, Germany. One of the morning stations, and now becoming louder. (Lee).

DJD.—11,770k.c., Berlin, Germany. This is the loudest German on this band. (Lee), (K.Mc.), (Keast).

DJE.—17,760k.c., Berlin, Germany. Not as strong as DJH, but can be followed fairly well on most nights. (Lee), (Keast).

DJH.—17,845k.c., Berlin, Germany. This German station has been heard at excellent strength on some nights, and, fortunately, now free from morse interference. (Lee), (Keast).

DJL.—15,110k.c., Berlin, Germany. Not as strong as the other Germans, but can still be heard.

DJN.—9540k.c., Berlin, Germany. Good in the afternoon and also in the early mornings, and from 3.5 p.m. in the afternoon. (Keast), (Lee).

DJQ.—15,280k.c. Around midday this one can be heard at very good level, and with excellent musical numbers. (Lee).

DJR.—15,340k.c., Berlin, Germany. This is one of the strongest Germans on this band, and is excellent strength on opening at 7.45 a.m. (Lee), (K.Mc.).

DJX.—9675k.c., Berlin, Germany. At 7.0 a.m. this German is one of the loudest on the 31-metre band. (Lee).

DJZ.—11,801k.c., Berlin, Germany. Used in the transmission closing at 2.0 p.m., but not very strong. (Lee), (Keast).

DZC.—10.290k.c., Berlin, Germany. Heard with special programme for South America one morning until 6.30 a.m.

DZH.—14,460k.c., Berlin, Germany. Heard quite often transmitting special programme directed to "Radio Splendide," Buenos Aires.

FRANCE

TPA2.—15,245k.c., Paris, France. Can still be heard at night, but, of course, not as strong as a few weeks ago.

TPA3.—11,885k.c., Paris, France. Quite a nice signal from this ever-popular French station around 7.0 a.m. (Keast).

TPB7.—11,885k.c. Same location. The same transmitter under this different call is heard well around 4.0 p.m.

TPA4.—11,718k.c., Paris, France. Heard well on most days till 2.0 p.m. (Lee), (Keast).

TPB.—7280k.c., Paris, France. Still coming in with an excellent signal in the early mornings. (Gaden), (Lee).

TPB3.—17,850k.c., Paris, France. On some nights this Frenchman is heard at very good strength. (Keast).

TPB11.—15.130k.c., Paris France. Quite a powerful signal at 5.0 p.m., and sometimes in early hours of the morning.

U.S.S.R.

RNE.—12.000k.c., Moscow, U.S.S.R. Heard best in their session which closes at 7.0 a.m., but can also be heard until 8.0 a.m. on Mondays and Tuesdays. (Lee).

RKI.—15.080k.c., Moscow, U.S.S.R. Heard in a special broadcast at 11.0 p.m. on Sunday, May 28.

RV96.—6040k.c., Moscow, U.S.S.R. In the mornings puts in a very loud signal, also after midnight. (Keast).

RV96.—9520k.c., Moscow, U.S.S.R. One of the most powerful stations on the air, and is heard well till 7.0 a.m. (Keast).

RV96.—15,180k.c., Moscow, U.S.S.R. This is probably one of the world's strongest short-wave stations, and comes in very well at various times. (Lee), (Gaden), (Keast).

DENMARK

OZH.—15,165k.c., Skamlebaek, Denmark. In the mornings at 7.0 is the loudest station on this band, with news till 7.15 a.m., followed by excellent musical numbers. (Butler).

OZH2.—15,320k.c., Skamlebaek, Denmark. Heard on a Sunday night from 11.0 at excellent strength.

NORTH AMERICA

W8XAL.—6060k.c., Cincinnati, Ohio. On most nights this American is good entertainment level until about 10.0 p.m.

W2XAF.—9530k.c., Schenectady, N.Y. Heard on some mornings at 7.0 a.m. when the Russian is not on. (Lee) (Keast).

W6XBE.—9530k.c., Treasure Island, Cal. This one needs no introduction, as it is excellent every night from 10.0 p.m. (Lee) (Gaden) (K.Mc.).

W1XK.—9570k.c., Boston, Mass. Only heard on one occasion at 11.0 p.m. when KZRM had faded away temporarily. (Keast) (Gaden).

W3XAU.—9590k.c., Philadelphia, Pa. This one heard on Mondays only weakly at 7.0 a.m.

W3XAL.—9670k.c., New York, U.S.A. Can be heard in the mornings after 8.0 a.m., and also at better strength in the afternoon until 3.0 p.m. (Gaden).

W1XAL.—11,790k.c., Boston, Mass. This station puts over some very interesting technical and scientific talks, and is heard best about 8.0 a.m. (Gaden).

W2XE.—11,830k.c., New York, N.Y. Can still be heard on a Monday afternoon, till they close down at 2.0 p.m.

W8XK.—11,870k.c., Pittsburg, Pa. Heard at reasonably good strength until closing at 2.0 p.m.

W9XAA.—17,780k.c., Chicago, Ill. Another unusual station heard by Mr. Keast one Sunday night.

W2XAD.—15,330k.c., Schenectady, N.Y. Mr. Butler has heard this General Electric station in one of their sessions.

W8XK.—15,210k.c., Pittsburg, Pa. Also heard by the above reader in one of their transmissions.

W6XBE.—15,330k.c., Treasure Island, Cal. Only heard faintly now with their Spanish transmission, closing at 1.0 p.m.

W2XE.—17,830k.c., New York. Heard on some nights from as early as 9.30 p.m. with quite good signal. (Lee), (Gaden), (Keast).

XETW.—6045k.c., Tampico, Mexico. Heard on some nights for a short time after 11.0 p.m. (Butler).

XEWW.—9500k.c., Mexico City, Mexico. Becoming louder again between 11.0 p.m. and midnight. (Keast).

XEGW.—6110k.c., Mexico City, Mexico. Reported by Mr. Keast as being heard at fair strength at 2.0 a.m.

XEXA.—6170k.c., Mexico City, Mexico. Their regular session opens at 10.30 p.m. with physical exercises.

SPAIN

EAQ.—9860k.c., Madrid, Spain. This old favorite has been heard frequently around 7.0 a.m. and later. (Butler).

RADIO MALAGA.—14,440k.c., Malaga, Spain. This one-time rebel station is again on the air around 7.0 a.m.

RADIO BURGOS.—7210k.c., Burgos, Spain. Puts in a very strong signal around 7.0 a.m.

RR6.—11,990k.c., Vittoria, Spain. On some mornings can be heard quite well, but on other days is interfered with by Morse.

ITALY

2RO3.—9635k.c., Rome, Italy. This popular Italian station gives very entertaining programmes every morning around 7.0 a.m., with frequent English announcements, and details of their other stations. (Butler), (Lee).

2RO4.—11,810k.c., Rome, Italy. Have only heard this Italian in the mornings at 7.0 a.m. (Keast).

2RO1.—6085k.c., Rome, Italy. This is the new Italian station which is heard until closing at 7.30 a.m.

2RO6.—15,300k.c., Rome, Italy. Heard in the early morning at 7.0, but only very weak, though on some mornings is very good strength when they open again at 10.30 a.m. (Lee).

NEW STATIONS

EACH month in this panel we will list all stations, definitely identified, which have not been previously reported heard, either at our own location or by our readers.

K.C.	Metres	Call	Location
6,125	48.98	MTCY	Hsinking, Manchukuo.
6,540	45.86	VHSU	Port Moresby, Papua.
9,280	32.31	ZP8	Asuncion, Paraguay.
9,535	31.46	SBU	Motala, Sweden.
9,580	31.32	KZHS	Manila, Philippine Is.
9,620	31.18	CXA6	Montevideo, Uruguay.
11,740	25.55	SP25	Warsaw, Poland.
15,100	19.86	EPB	Teheran, Iran.
15,120	19.84	SP19	Warsaw, Poland.
15,155	19.79	SBT	Motala, Sweden.
15,170	19.77	LKV	Oslo, Norway.
15,190	19.75	OIE	Lahti, Finland.

2R08.—17,820k.c., Rome, Italy. At our location this station is now only faintly heard. (Keast).

2RO9.—9667k.c., Rome, Italy. This Italian station is now not quite so loud as it was previously, but still good. (Lee).

IRF.—9830k.c., Rome, Italy. Opens at 10.30 a.m., but rather weak, and has a bad flutter effect.

IQY.—11,675k.c., Rome, Italy. On some mornings heard well till just after 7.0 a.m. Do not be misled, as they very often give a transmission in Russian.

PORTUGAL

CSW2.—11,040k.c., Lisbon, Portug Heard the first part of last mont but has now been replaced by CSV on 9735k.c.

CSW7.—9735k.c., Lisbon, Portugal. Th station has recently opened up aga on this frequency, and puts in qui a strong signal in the early mor ings.

CS2WD.—5977k.c., Lisbon, Portug Still being heard every day from b fore 7.0 a.m., and sometimes qui loudly.

READERS' REPORT

Dr. K. B. Gaden (Thargomindah, Qld.), is now a confirmed U.H.F. listener, having logged quite a number of the 11 metre band stations, which, judging from his letter, are heard at very good strength in his district. Keep a look-out for W9XPD, on 31,600 kc, as he is audible every day now, also quite a number of the police radio stations in California and elsewhere.

Mr. L. J. Keast (Randwick, N.S.W.) sends us a very long letter covering his listening during the past few weeks, and, judging by some of the reception times, he has been burning the midnight oil, and to some advantage, too. Mr. Keast was first to advise us of the new Manila station KZHS. Regarding your query as to the correct call letters of Durban on 30.75 m. It is definitely ZRO, as shown in our lists. Our authority for this is a letter from the South African Broadcasting Corporation. Congratulations on logging W9XAA on the 16 metre band. I have added your mystery station to our panel, in the hope that someone can identify it.

Mr. J. Butler (Bellevue Hill, N.S.W.) is a new contributor to our pages, and we hope a regular one. He sends a very comprehensive report of his listening during the last few weeks, as will seen from the "Listen for These" se tion. Mr. Butler was responsible f identifying the D.E.I. station on 7200 k which was one of our original myste ones, and suggests it is probably YD on 7220 kc. We agree with him, a have accordingly listed it as such. W shall be very pleased to receive a month ly report from you, and thank you f your nice remarks re the short wa section.

Mr. A. Lee (Dubbo, N.S.W.) aga sends us a very interesting letter, givi a list of his loggings. Regarding yo query re the station on 32 m. on Su days. This would almost certainly OAX4J on 9340 kc, in Lima, Peru. "Rad Universal," P.O. Box 1166. They a anxious for reports, but have not verifie ours of two years ago! If possible, wou like reports to hand by the 10th of eac month.

"K. Mc." (North Fitzroy, Vic.): Amon other interesting items in this reader letter, we learn that, according to th P.M.G. Department, the new Perth Na ional S.W. station will probably take th air in July or August, and will operat on 6130 kc, 9560 kc, and 11,830 kc. Man thanks for this information and a your other notes and kind remarks.

INDIA AND ASIA

VUD3.—9590k.c., Delhi, India. Opens at 10.30 p.m., with chimes at 6.0 p.m., followed by news in English. (Lee), (K.Mc.), (Keast).

VUD4.—15,290k.c., Delhi, India. On some days is fairly strong around 1.0 p.m. (Butler), (Keast).

VPB.—6160k.c., Colombo, Ceylon. Heard nightly with quite a good signal after 11.0 p.m.

XYZ.—6007k.c., Rangoon, Burma. Another station heard nightly, and quite good around midnight. (Butler).

KZIB.—9500k.c., Manila, P.I. This one has now become one of the regular night stations, and is heard well. (Lee), (K.Mc.).

KZHS.—9580k.c., Manila, Philippine Islands. As mentioned elsewhere this is a new station recently heard. (Keast), (Butler), (Gaden).

KZRM.—9570k.c., Manila, Philippine Islands. Around 11.30 p.m. this real old-timer comes in at excellent strength. (Lee), (Keast), (K.Mc.).

ZHJ.—6057k.c., Penang, S.S. Now very much louder signal than previously, and can easily be recognised, closes at 12.40 a.m.

ZHP.—9690k.c., Singapore, S.S. This popular Malayan station is now one of our regulars every night. (Lee), (Keast).

HS6PJ.—9510k.c., Bangkok, Siam. Can now be heard on four nights weekly, Monday, Wednesday, Thursday, and Saturday. (Butler), (Keast).

RADIO SAIGON.—6116k.c., Saigon, French Indo-China. A very powerful station, which should be heard by all listeners nightly. (Butler), (K.Mc.), (Lee).

YDA.—6045k.c., Tanjong Priok, D.E.I. Always heard at good strength at night, with the regular NIROM programme.

YDB.—9550k.c., Bandoeng, Java. After midnight comes in at fair strength. (Keast).

YDC.—15,150k.c., Bandoeng, Java. Heard in the mornings at 9.0, and also late at night when it is much better strength. (Butler), (Lee).

YDX.—7220k.c., Medan, Sumatra. It would appear from a folder kindly sent us by Mr. Butler that this is the NIROM station we listed formerly as being on 7200k.c. (an original mystery station). It is still being heard well with native programme till 11.15 p.m., and later the regular NIROM European type session. (K.Mc.).

PMH.—6720k.c., Bandoeng, Java. Very strong with their native programme. Practically a year round station. (Lee).

PMN.—10,260k.c., Bandoeng, Java. This one is used in chain with the other NIROM transmitters every night. (Lee).

PLP.—11,000k.c., Bandoeng, Java. Another station heard very well every night. (Lee).

PLV.—9415k.c., Bandoeng, Java. Very often heard after 10.0 p.m., working telephony with other D.E.I. transmitters.

MTCY.—6125k.c., Hsinking, Manchukuo. This is the new station mentioned in our article.

JDY.—9920k.c., Darien, Manchukuo. Still giving war news and musical selections nightly, commencing at 10.0. p.m.

JFO.—9635k.c., Taihoku, Taiwan. This station never seems to increase in strength, but is there every night.

JIB.—10,535k.c., Taihoku, Taiwan. Still giving their news in English at midnight. Very hard to get verification, as we have now sent four letters, but no response.

JLT.—6190k.c., Tokio, Japan. Often heard with telephone traffic, and also with regular programme towards 11.30 p.m.

JLG.—7285k.c., Tokio, Japan. Only heard on two occasions at our location at 6.0 a.m.

JZI.—9535k.c., Tokio, Japan. On some nights this one can just be heard, but hopelessly mixed with W6XBE and ZBW3.

JLT2.—9645k.c., Tokio, Japan. On some mornings this Japanese is strong, and on other days can barely be heard. (Keast).

JLG3.—11,705k.c., Tokio, Japan. This station gives a news service in English at 5.30 a.m.

JVW3.—11,720k.c., Tokio, Japan. Heard just after 7.0 a.m. with physical exercises. (Lee), (K.Mc.).

JZJ.—11,800k.c., Tokio, Japan. On the air every night, but not as strong as JZK in the 19-metre band.

JZK.—15,160k.c., Tokio, Japan. Heard very well at night when it even interferes with YDC. (Butler), (Lee).

ZBW3.—9525k.c., Hongkong, China. Now becoming very much stronger at night and suffers slightly from W6XBE. (Lee).

ZBW2.—6090k.c., Hongkong, China. Mr. Butler heard this transmitter on one night, but it is not generally used.

XPSA.—6980k.c. Kwei-yang, China. Very strong every night. There appears to be some difference of opinion as to actual call letters, but we believe the above to be correct. (Lee).

XJOB.—6880k.c., Shanghai, China. Still being heard with a strong transmission every night, with English announcements.

XGX.—9300k.c., Shanghai, China. Opens at 11.0 p.m. with loud carrier, but weak signal.

XMHA.—11,850k.c., Shanghai, China. Not as loud as they were a few weeks ago. (K.Mc.), (Keast).

XGOY.—11,900k.c., Chungking, China. Still being heard with a very loud signal from around 9.0 p.m. onwards. (Lee), (K.Mc.), (Keast).

XGOK.—11,820k.c., Canton, China. The English news session was heard until closing at 11.30 p.m. Lady announcer gave frequency as 11.650k.c., but they are actually on 11,820k.c.

CENTRAL AMERICA AND WEST INDIES

COCQ.—8830k.c., Havana, Cuba. When first opened, this was the most powerful Cuban, but is now only fair on opening at 9.50 p.m. (Butler), (Lee), (Gaden).

COBZ.—9030k.c., Havana, Cuba. Now comes in nicely from 10.45 p.m., with frequent mention of Radio Salas. (Gaden).

COJK.—8660k.c., Camaguey, Cuba. This unusual Cuban was heard by Dr. Gaden in a special transmission around 9.30 p.m. for Los Angeles. Probably taking programme from Havana. We have now heard this station every night from 10.0 p.m.

COBX.—9200k.c., Havana, Cuba. An infrequently heard Cuban, which now has become audible until closing at 3.0 p.m.

COCH.—9437k.c., Havana, Cuba. Heard on most nights, but very uninteresting programme, with numerous advertisements.

COCM.—9833k.c., Havana, Cuba. Not so strong as some of the other Cubans, but can be heard around 11.0 p.m. and 3.0 p.m.

COBC.—9995k.c., Havana, Cuba. This Cuban can be heard nearly every night at fair strength, opening at 10.0 p.m.

COCX.—11,740k.c., Havana, Cuba. Opens nightly at 10.55 p.m., but is not very strong.

COGF.—11,800k.c., Matanzas, Cuba. Only heard on some nights, when they open at 11.0 p.m., and, of course, interfered with by JZJ.

TIPG.—9620k.c., San Jose, Costa Rica. Now one of the best stations at night after opening at 10.0 p.m. with a stirring march. (Butler), (K.Mc.), (Keast).

TI4NRH.—9680k.c., Heredia, Costa Rica. Heard one Sunday night in a test transmission. They seem to have discontinued their regular programmes.

HI3X.—15,270k.c., Ciudad Trujillo, Dominican Republic. Comes in well on first Sunday of the month from 10.40 p.m.

RADIO MARTINIQUE.—9700k.c., Fort-de-France, Martinique, F.W.I. Not so strong this month as before, but still quite well heard till 7.0 a.m. on Mondays. (Butler).

TG2.—6190k.c., Guatemala City, Guatemala. Heard on Sunday afternoons with quite a good signal.

TGWB.—6490k.c., Guatemala City, Guatemala. Not as strong as a few weeks ago, but heard nightly.

TGWA.—9685k.c., Guatemala City, Guatemala. Has been giving special programmes on Sunday afternoons until 6.30 p.m. (Keast).

HP5K.—6005k.c., Panama City, Panama. Opens nightly at 10.0 p.m., but not as strong as previously, and interfered with by XYZ.

HP5J.—9607k.c., Panama City, Panama. Opens nightly at 10.0 p.m., but only gives announcements in Spanish. Watch out for them on Sunday afternoons with special programmes conducted by their English announcer, Mr. Williams. (Butler), (Keast).

HP5A.—11,700k.c., Panama City, Panama. Now opens with a waltz at 10.0 p.m.; not very strong as yet.

SOUTH AMERICA

LRX.—9660k.c., Buenos Aires, Argentine. On Sunday nights LRX opens at 9.30, with their familiar waltz, and can also be heard in the afternoon till closing at 2.30 p.m.

LRAI.—9690k.c., Buenos Aires, Argentine. On some mornings is quite strong when they open at 8.0. Verifies promptly.

OAX5C.—9380k.c., Ica, Peru. Heard on Sunday afternoons until 3.0 or later. (Keast.)

OAX4T.—9562k.c., Lima, Peru. Can now be heard at very good strength when they open at 10.0 p.m. (Butler).

OAX4J.—9340k.c., Lima, Peru. Heard best on Sunday afternoons, closing at 3.0 or 4.0. (Butler), (Lee).

ZP8.—9280k.c., Asuncion, Paraguay. Heard for the first time on Sunday afternoon, May 28, at 4.30.

HCJB.—12,460k.c., Quito, Ecuador. This one was heard nearly every night with their special Australian transmission, as mentioned in last month's notes (Butler), (Gaden), (Lee), (Keast).

PSE.—14,940k.c., Rio de Janeiro, Brazil. One of this station's programmes in German came in at excellent strength one morning until closing at 7.30.

PSH.—10,220k.c., Rio de Janeiro, Brazil. Can just be heard when they open at 9.0 a.m., but soon fade out. They send a very attractive verification card.

CXA6.—9620k.c., Montevideo, Uruguay. This is a new station which we have now heard for the last two weeks at 7.0 a.m. in their rebroadcast of CX6. Fades out by about 7.30 a.m.

CXA8.—9640k.c., Montevideo, Uruguay. Now opens on a Sunday night at 9.30 with announcements in various languages. On Sunday afternoon can also be heard, at better strength.

CB960.—9600k.c., Santiago, Chile. This one is now often heard after 10.0 p.m. with physical exercises, and frequent mention of Radio Americano; while on Sunday afternoons they stay on the air till 3.0 or later (Butler), (Keast).

CB970.—9730k.c., Valparaiso, Chile. This South American can be heard best on Sunday afternoon till about 3.0.

CB1180.—11,990k.c., Santiago, Chile. Opens at 10.30 p.m., and on most nights is very strong, but weakens by 11.0 p.m.

CD1190.—11,910k.c., Valdivia, Chile. Only heard on one Sunday afternoon till closing at 3.0.

CB1174.—11,740k.c., Santiago, Chile. Heard at good strength at the early hour of noon one Sunday.

AFRICA

CR7AA.—6,137k.c., Lourenco Marques, Mozambique. Can be heard every morning with a reasonably good signal.

CR7BH.—11,718k.c., Lourenco Marques, Mozambique. On one morning we heard this one at 4.0, but not as strong as their other transmitter in the 49 metres band.

ZRH.—6007k.c., Roberts Heights, South Africa. On most mornings can easily be followed around 7.0.

ZRL.—9606k.c., Capetown, South Africa. Only heard in the very early hours, around 2.30 a.m., but easily recognised.

EAJ43.—10,370k.c., Teneriffe, Canary Islands. Heard quite well in the early mornings, at about 6.0; lady announcer.

TPZ3.—8960k.c., Algiers, Algeria. Again heard at better strength than last month, around 5.0 p.m., phoning Paris.

IABA.—9650k.c., Addis Ababa, Ethiopia. Heard in the early morning best at about 2.30, and also later, at 7.0.

MISCELLANEOUS

RADIO EIREANN.—9595k.c., Moydrum, Eire. This Irish station does not appear to have settled down, as on some mornings they are heard opening at 7.30 a.m. with a very good news session, and then are sometimes not heard again for two or three days. According to station information, they are supposed to close down at 7.30 a.m.

YUA.—6100k.c., Belgrade, Yugoslavia. Comes in every morning at 7.0 with a fair signal.

EPB.—15,100k.c., Teheran, Iran. This is the new station mentioned in our other article.

OFD.—9500k.c., Lahti, Finland. Now becoming faintly audible in the mornings around 7.0.

LLG.—9610k.c., Oslo, Norway. Another regular one on this band in the early mornings, but not very strong.

LKV.—15,170k.c., Oslo, Norway. Can just be heard very weakly at night around 10.0 p.m., but difficult to separate from the Jap.

LKQ.—11,740k.c., Oslo, Norway. Comes in at nice level from around 6.30 a.m.

LKJ.—6130k.c., Oslo, Norway. Carries same programme as LKQ.

TAP.—9465k.c., Ankara, Turkey. Still one of the strongest stations on this band. Understand that verifications are now being sent out, after a long delay. (Butler), (Lee), (Keast).

TAQ.—15,190k.c., Ankara, Turkey. Only heard very weakly now, and only on certain nights. (Butler).

HBJ.—14,535k.c., Geneva, Switzerland. Heard this station with a special broadcast until 7.0 a.m. on Monday, May 29.

HBO.—11,400k.c., Geneva, Switzerland. Comes in with a nice signal, and closes down at 4.15 p.m. on Mondays.

ORK.—10,330k.c., Ruysselede, Belgium. At our location can only be heard between 5.45 a.m. and 6.0 a.m.

SBO.—6065k.c., Motala, Sweden. Comes on the air every morning at 7.15, and at quite good level.

SBP.—11,705k.c., Motala, Sweden. Comes in nicely in the mornings, just after 7.0.

LYZ4.—15,310k.c., Kaunas, Lithuania. Heard on some nights weakly, but can be identified by distinctive 13 tone chime. (Butler).

SP31.—9520k.c., Warsaw, Poland. This experimental station is still very weak around 6.0 a.m.

PCJ2.—15,220k.c., Huizen, Holland. Around 10.30 p.m. can be copied at fair level. (Lee).

PH12.—17,770k.c., Huizen, Holland. Now very weak until near midnight, and does not improve much then.

SBT.—15,155k.c., Motala, Sweden. This is the new station reported elsewhere.

SBU.—9535k.c., Motala, Sweden. The other new Swedish station on the 31 metre band opening at 7.15 a.m.

SP19.—15,120k.c., Warsaw, Poland. This is the Polish station which opens at 9.0 a.m. with English announcement, used at the same time, but much weaker

SP25.—11,740k.c., same location, and in strength.

OIE.—15,190k.c., Lahti, Finland. Comes in very well with same programme as OFD on 9500k.c., from 6.30 a.m. onwards.

Radio Tananarive.—9690k.c., Tananarive, Madagascar. This one opens at 1.0 every morning and is quite good strength, but rather distorted at times.

VQ7LO.—6082k.c., Nairobi, Kenya. Comes in at very good strength in the early morning (Keast).

AUSTRALIA AND OCEANIA

VLR.—9580k.c., Lyndhurst, Victoria. This National transmitter is now heard in its day sessions on this frequency, but at our location is very poor at nights. (Lee).

VK2ME.—9590k.c., Sydney, N.S.W. To all Sydney and suburban residents this is a very entertaining Sunday station.

VK3ME.—9503k.c., Melbourne, Vic. Only heard very weakly at our location, and will soon be inaudible.

VK6ME.—9590k.c., Perth, West Australia. Some nights this one is good entertainment level, and on other nights is inaudible. (K.Mc.), (Lee), (Keast).

VK9MI.—6055k.c., M.V. Kanimbla. A very powerful but broad signal from this ship transmitter on most nights. (Lee).

ZMBJ.—8840k.c., R.M.S. Awatea. Can be heard in telephone conversations with both Sydney and New Zealand in the late afternoons, but usually with scrambled speech.

FK8AA.—6122k.c., Noumea, New Caledonia. Only heard on one occasion, but probably audible in other parts more frequently.

VPD2.—9535k.c., Suva, Fiji. Another regular night station, which closes at 10.0 p.m. (Lee), (K. Mc.).

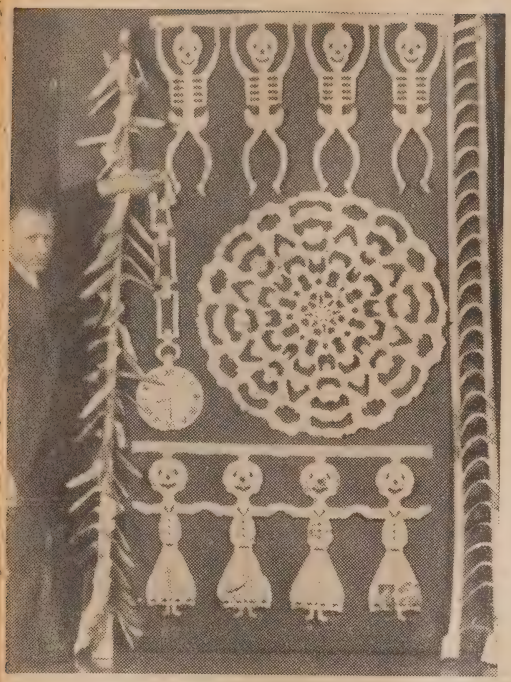
VHSU.—6540k.c., Port Moresby, Papua. New station, heard in early mornings, as noted elsewhere.

DJP NOW REPLACES DJZ

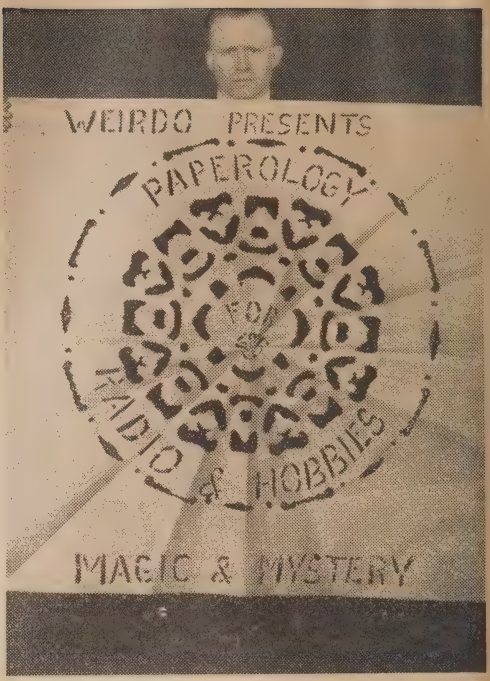
The German stations now appear to be using DJP on 11,855kc., 25.32m. instead of DJZ on 11,801kc., 25.42m., in the sessions which closes at 2.0 p.m. The change is a good one, as DJZ was badly hetrodyned by COGF, who is also on the air at the same time.

PENANG CHANGES WAVE-LENGTH

According to Mr. J. Butler, the Penang station ZHJ is now transmitting on 49.2m. instead of their usual one of 49.51. Just as we go to press we heard a station on 6090kc., 49.25m., which seemed to be Penang, and which was coming in at great strength so they seem to be moving around a bit.



Some fascinating examples of "Weirdo's" work. Each pattern was completely torn before the paper was unfolded.



A pattern made on the spur of the moment, in which "Weirdo" pays a compliment to Radio and Hobbies.

WHAT IS A PAPEROLOGIST?

WEIRDO TELLS US

WHAT is a paperologist? It's no use referring to Webster's dictionary, either, you'll not find it there. "Paperologist" is a made-up word for a magician who performs his entire act with paper, and paper only. Such a person is Weirdo, whose photograph appears above. "Weirdo" is a Sydney magician who has specialised in magic with paper, and is, as far as I can gather, the only professional magician appearing regularly who does an entire act with paper only to aid him. Of course, "Weirdo" has many other mystifying tricks and illusions included in his regular two and a half hours mystery show, but it is as a "paperologist" that he is probably more widely known.

There are many reasons why paper tricks are to be preferred. They can be made showy—a very desirable consideration in any production. They are light, inexpensive, and easy to carry, occupying a very small space in packing, and this is an important item with many professional and semi-professional magicians.

In addition to the actual tricks or mysteries performed with paper, there is another branch of this form of entertainment, known as paper-tearing and paper-folding, in which the performer makes all kinds of items, such as a fir-tree, a ladder, a ship's wheel, an onion bag, cut out patterns for carpets, a frieze or dado, magic linking rings, and many other things—all folded and torn, quickly and with a deftness that fascinates as the various articles take shape before your eyes.

HEY PRESTO!

Hey Presto! Abracadabra!

Magician friends, you amaze me!

When I offered a FREE Magic Book for the correct solution to a puzzle in our last issue, I did not realise you would find the problem as easy as you did. Actually, after I had set the problem, I had considered it too difficult for our first effort. In reply you sent in correct answer after correct answer, and I found it difficult to determine to whom I should award the prize, however, if you turn the page to our puzzle corner the lucky winner's name is announced. So many replies came in on the first day that I could not award the prize to the FIRST correct answer received, so I put all the correct names in a box at the time of writing this and drew one out. I think you will agree with me that this was the fairest way of deciding who should get the book. Now, so that you all will not be disappointed, I have decided to give to ALL who sent in a correct solution, another smaller book if you care to send me a 2d stamp for postage together with your full name and postal address. It's absolutely FREE to those whose names appear on the next page together with the correct solution and the winner's name. Also, another puzzle is announced for this month, and another book will be given to the winner. This time, I intend making the problem just a little harder.

With best wishes. Yours for better Magic.

Barry Kent.

by Barry Kent

MAGIC

AUSTRALIANS SUCCEED IN LONDON

Among the finest professional magicians in the world to-day, Australia is well represented. This article tells something about the activities of many stars you may have seen yourself.

ONE frequently reads in the daily Press welcome news telling us about the success of Australian singers, musicians, actors, and actresses in England. In "Wireless Weekly," June 14, there appeared a paragraph headed, "Australian Show Folk Succeed in London."

On reading this my thoughts immediately flashed to many of the Australian magicians now in London. The paragraph commenced: "Practically all of the many Australian theatrical and musical personalities now in England are achieving great success"—but not an Australian magician's name followed, and not because there aren't any, for Australian magicians in London are among the leaders of their profession over there.

THE GREAT LEVANTE

One—The Great Levante—has one of the biggest and most successful magical full evening shows in the world. Levante was born in Sydney in 1892, and began his profession in Australia in 1910. Since then he has toured Australia, New Zealand, China, Malay States, India, and England, where his name now ranks with the great magicians of all time. (See "Who's Who" in this issue.)

There is also Murray, another Sydney boy—Manly to be exact—at present topping the bill with his magic in the principal theatres of England. In addition to his excellent magic and illusion work Murray is probably better known for his rare ability as an escapologist—nothing can hold him.

POLISHED ROOKLYN

Then, of course, there is polished Rooklyn, "watch his fingers," who for three years has been appearing with great success in leading London theatres as well as the principal theatres throughout Great Britain.

Maurice Rooklyn returns to Sydney this month, and will again appear professionally. Another Australian, James the Mad Magician, recently seen at the Tivoli Theatre, Sydney, and in other States on the Tivoli circuit, also in New Zealand.

JAMES THE MAD MAGICIAN

James recently went to England, and we have no doubt that before long he too will be hitting the high spots. His Australian and New Zealand friends sincerely hope so. Cecil Keech is still another Sydneyite of magic fame to be doing well in England.

I remember an English magician who recently toured Australia was asked by some of his English friends on his return to London if he met many magicians in Australia. His reply came back without hesitation: "Only two or three—they all seem to be over here"—meaning in England. When magicians gather for a "get together" the conversation often turns to Australia and Australian magicians, and with the magic fraternity of England Australia is frequently referred to as "the home of magicians." This is no doubt due to the success of such a number of Australian magicians in England.

Thinking ahead, I am wondering who will be the next of our Australian magicians to "magish" for England audiences.

WHO'S WHO IN MAGIC

THE GREAT LEVANTE

Levante—truly a great magician. Newspapers all over the world refer to the great Levante as the famous Australian illusionist. Yes, it's true—one of the world's greatest magicians born in Aussie. It would be just as true to call him the international illusionist, for he has appeared with his show in so many different countries. Levante was born in Sydney, and began as a professional magician in 1910—correct name, Leslie George Cole. At present he is appearing in England with his own magical revue, "How's Tricks," in which his charming wife and daughter both assist, together with twenty-eight assistants, both male and female. His full show occupies about two and a half hours' magical entertainment, and includes many large illusions and other general magic items and escapes. Over twenty tons of magical mystery go to make his great show. Newspapers refer to his production in such terms as "the fastest and most baffling entertainment in existence." Judging from the photographs of "How's Tricks" received in Australia, the production can truthfully be referred to as "different." In one of his great thrillers a young lady is visibly loaded into a brass shell and placed into a cannon in full view, and fired through a sheet of armor plate. The shell containing the lady is caught in a large net. It is gratifying to know

that it is an Australian who is considered to be the leading British magician to-day. When will Australia see Levante and "How's Tricks" is the question we are all asking. Will he tell us?

Next Month—NICOLA

THE MAGIC FIR-TREE

How The Paper Is Torn

Over the page you will see "Weirdo" with a giant fir tree on the left of the photograph. You can make one of these easily. Take a number of pieces of paper about a foot wide and roll together. The roll is then cut or torn lengthwise in three places until a point is reached about half way down. The pieces are bent down, and the centre piece pulled out making the tree as it is pulled to a height of six or eight feet. Photograph shows paper rolled and torn, about to be pulled out from the centre.

ABRACADABRA

THE MAGIC WORD

Something about a strange word which has always been associated with magic for hundreds of years.

I HAVE frequently been asked the meaning of "Abracadabra." If we look up the dictionary it says: "a cabalistic word thought to have healing properties as a charm; any mysterious or incomprehensible formula." Magicians all the world over frequently use this word when about to bring some trick to a climax. The breathing of the magic word usually brings about the element of mystery, or breaks the spell that is supposed to accompany certain doings. Years ago the ancients had this word inscribed on parchment slips fastened around their necks. When worn in this way the individual was supposed to be proof against evil spirits, especially the dreaded evil eye. Other ways were adopted to counteract the effects of an "evil eye." Small polished stones or pieces of metal bearing a representation of the "evil eye" were worn, in the belief that one eye would frighten the other away. "Abracadabra" is also a strange word in another respect. When written in this form:

ABRACADABRA
BRACADABR
RACADAB
ACADA
CAD
A

It will be seen that the word can be read along the top line and also down and up the two sloping sides.

Hey presto! Abracadabra!

SOLUTION TO LAST MONTH'S PROBLEM

THE DRAUGHT BOARD

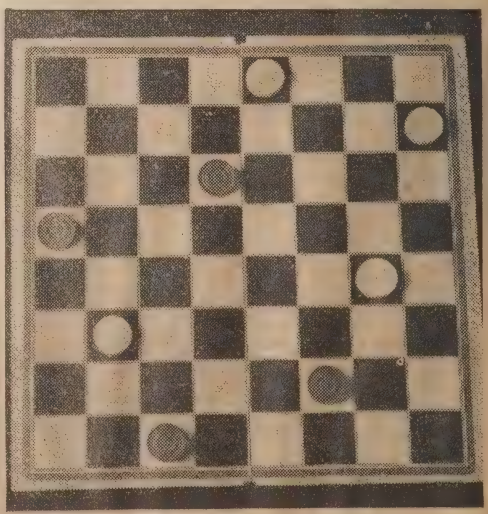
HERE is the solution to the draughtboard problem contained in the June issue of "Radio and Hobbies." The winner is:

Norman Hooper, 22 Ormond-street, Kensington, Vic.

and the Magic Book prize has been forwarded. Many others also forwarded a correct answer. If the following readers who sent in the correct solution will send me a 2d stamp I will post you by return mail a smaller book FREE with my compliments.

R. Muir-Morris; Miss Tena Nicolaides; Renald Wilson; F. Whitehouse; Graham Carter; A. J. Ferme; Len Hopkins; W. Thompson; A. C. Lonsdale; George Allen; N. J. Mayoh; G. Bartlett; Harry Colman; Hartley Newell; Norman Linehan; G. Sabin.

This diagram shows exactly how the draughts are placed on the board to conform with the conditions laid down in the June Issue.



"Charlie Howard"

SYDNEY'S VENTRILOQUIAL DOLL

HERE you see the "nerve centre" of Charlie Howard, Sydney's ventriloquial personality, who, with the aid of his master can wink an eye, raise his eyebrows, close both eyes—either separately or together, smile, frown, smoke a cigarette and do almost human things. The mechanical perfection of Charlie is really something to marvel at for this particular kind of entertainment. Even when a funny story is told to Charlie, his hair will actually stand on end under the control of his assistant.

A ventriloquial doll of this nature is somewhat difficult to handle and a considerable amount of experience and manipulative ability is necessary before the performer is capable of getting the best effect from such mechanical perfection. His present owner, however, is a capable ventriloquist and under his direction and control Charlie has become almost as famous in Sydney as his American cousin, Charlie McCarthy.

Charlie Howard, as he appears to his "assistant."

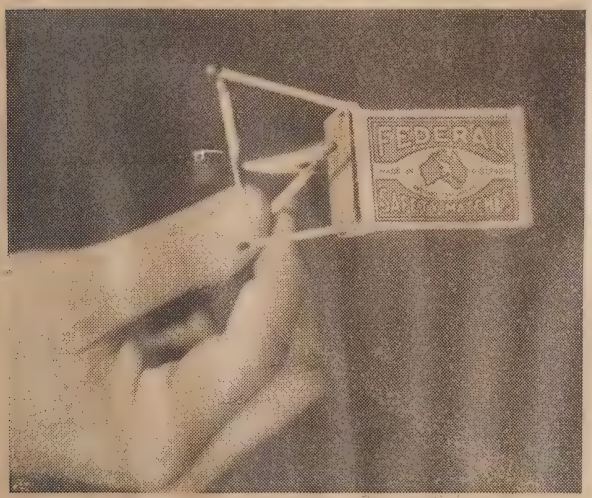
"THE SPHINX"

"THE Sphinx" is an independent magazine for magicians and is published monthly in New York, America.

It is available in Australia from most of the magic dealers in the capital cities, or may be ordered direct from the publishers. It is about the same size as "Radio and Hobbies" or a litle larger and has usually about fourteen pages with numerous photgraphs, drawing, &c., devoted to magicians and their tricks.

The cover usually has some outstanding personality in magic. There are advertisements throughout giving particulars regarding new tricks and general magic apparatus. Reports of various Magic Clubs and societies are also included.

WHICH END BURNS FIRST?



INSERT two matches in the end of a matchbox a shown and put a third one between the tw upright ones. Now, ask your friends to say whic of the two side matches will catch fire first if th one in the centre is lighted exactly in the middl Most people will choose the sulphured ends. Tr it yourself—you will be surprised at the result.

MOVIES

☆

By
FRANK EASTMAN

☆

One of the twenty wind machines, used in the Goldwyn production of "The Hurricane." In this film, an entire island was swept away by wind and flood. The church in the background was destroyed by dragging away parts with steel cables concealed from the cameras. A small model was used in the more spectacular scenes of the break-up.

THE camera can't lie.

But in the hands of expert technicians, both amateur and professional, that little black box an be made to tell the most amazing ntruths, producing effects that are lmost unbelievable.

In this article, we propose to deal with number of well-known camera tricks nd show you the cunning behind ollywood's sandstorms, floods, appearnces and disappearances.

Trick pictures are by no means an novation. Nearly 30 years ago, a oducing company in Paris produced a m entitled "The Magnetic Man." A orkman put his coat near an electric ynamo while he lunched. When he onned the coat, it attracted every metal oject as he passed by. Pillar boxes ung lovingly to him, coal hole covers nbraced him with all the fervor of a oor relation. Lampposts bent their ps toward him—and early audiences ughed their heads off at his predicaent.

It was, of course, a clever combination "camera-stop" (a term explained later) and piano wire. The coal hole cover, pillar boxes and lampposts were dragged about with lengths of piano wire, invisible to the camera, and manipulated by property men outside the camera's angle.

FRENCH ACTIVITIES

The French were in the van when it came to those early trick films. We were given "A Voyage to Mars" and "By Rocket to the Moon." By means of double exposures and maskings of the lens, we saw actors dwarfed by giants and rockets soaring from the earth to the moon. Childish and rather primitive as these efforts seem to the modern audience, satiated with pictures like "King Kong" and "The Invisible Man," they were regarded by Grandma as something far more mystifying than present-day television or the Einstein theory.

To attempt a detailed annotation of every trick picture would require a set of volumes dwarfing the Encyclopaedia Britannica, since the sweeping statement that nothing is impossible to the motion picture camera is one of the very few true statements to come out of Hollywood.

Therefore, let us take a few outstanding examples of the Hollywood magicians' technique and translate that magic into intelligible terms for the general public.

To this student of motion pictures, the outstanding trick film of all time —I refer now to camera tricks rather than mass spectacles like hurricanes and floods—was "The Invisible Man," in which Claude Rains performed the most courageous thing any actor can be called on to do. He remained totally invisible until the last three feet of the picture! Rains, in the name-part, walked through the entire film as a dangling cigarette, a flapping shirt, a swathe of bandages—and the most arresting voice we had heard till Hitler delivered his September speech to the Reich. But outside the camera angles, how the Universal Special Effects Department toiled!

THE INVISIBLE MAN

One of the most astonishing tricks occurred shortly after the beginning of the picture. Rains, as the Invisible Man, walks into a village hotel. He is overcoated, gloved, hatted, and his face is swathed in bandages.

The inn-keeper's wife, suspicious of his appearance, goes to his room and demands that he reveal his face. Rains, goaded by her threats to call in the police unless he unmasks, proceeds to do so. He takes off his hat and proceeds to unwrap the bandages from his head to reveal—nothing! When he has finished, a ghoul with no head pushes the screaming inn-keeper's wife from the room. Left alone, he removes coat, shirt, and walks the room as a pair of trousers alone. When these are discarded with his shoes, all that remains is a pendulous cigarette, dangling in the air, presumably from this extraordinary being's lips!

And it was all accomplished by black velvet and double exposure.

An actor doubled for Rains. The wardrobe department made him a tight suit of black velvet—a second skin that covered every portion of his body, fitting tightly over his face and head. Then they stood him against a wall built of three-ply and faced with black velvet. Black velvet against black velvet, plus a tricky arrangement of lights—and to the camera's eye, the man was completely invisible, the velvet merging absolutely.

CAN ACHIEVE THE IMPOSSIBLE

wonders behind the scenes.

How often have you seen things on the films so marvellous that you exclaim, "It can't be true!" Often it is true, but often it isn't. The creation of marvels for the screen is an art in itself. Here is an explanation of some film mysteries which have puzzled you in the past.

Thus, when the actor was dressed in clothes of a light color—contrasting with his background—and his head bandaged in white ribbons, it was simplicity itself to strip off the bandages against that background and reveal his black velvet head. Or rather, reveal nothing, since that head was invisible against the background.

Next, the film was re-wound, the camera taken to the hotel set, with its chairs, bed, table, &c., and this scene double exposed on the first. The result—since the light-colored furniture photographed clearly on the black velvet background—was that the Invisible Man went through these extraordinary antics in normal surroundings.

Such extreme care was taken with these big effects that it is interesting to note that one trick sequence in this film was marred by a ludicrous piece of carelessness. Rains, naked except for a shirt, rushes out into the snow. He finds himself hunted by the irate villagers, discards the shirt, and runs naked across the field of new snow. The hunters follow his trail by the imprint of his footsteps which mark the snow as he runs.

But through some remarkable oversight, instead of marks of Rains's bare feet appearing in the snow, there appeared a line of well-defined shoemarks, complete with sole and heel!

"KING KONG"

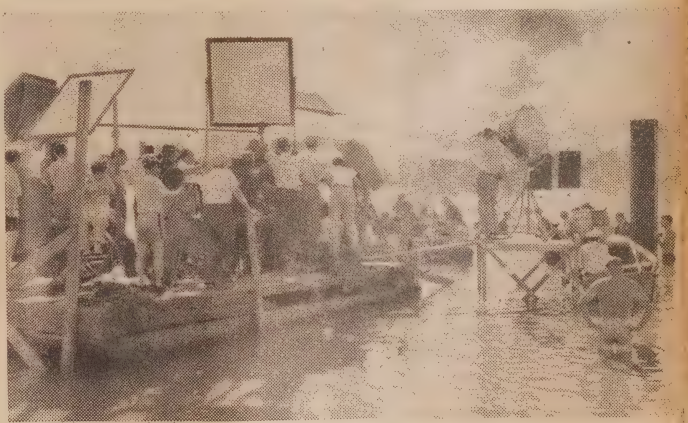
Double exposure and "single-frame work" was the cause of "King Kong," the beer barrel that walked like a man. You remember it? A party of explorers find a giant ape who could conveniently dwarf A.W.A's. wireless mast and proceed, for no apparent reason, to bring him back to New York. There he climbs, nonchalantly though a trifle jerkily, about skyscrapers, frightens fits out of Fay Wray by making a pass at her through a 60-story window, and is eventually given his quietus.

Kong, the realists explain, was a wooden dummy about six inches tall. He was made to walk by setting his wooden limbs, photographing a single frame, setting his limbs again, photographing again, and so on until ten separate movements and ten separate exposures made Kong walk across the screen. (The picture, incidentally, took three years to make—and can you wonder!)

Kong climbed about minature sets, shot one frame at a time, and the human figures were superimposed, or double exposed over his perambulations. For instance, a close-up of Kong, grinning ferociously, would be superimposed with a very long shot of Fay Wray in which that actress looked like a midget. Kong, regretfully, was a little before his time. His movements were jerky and unlifelike. His offspring, "The Son of Kong," made by R.K.O. in a further burst of enthusiasm, was definitely no credit to him. A disappointing, ludicrous child, it was laughed off the screen. Vale, Kong!

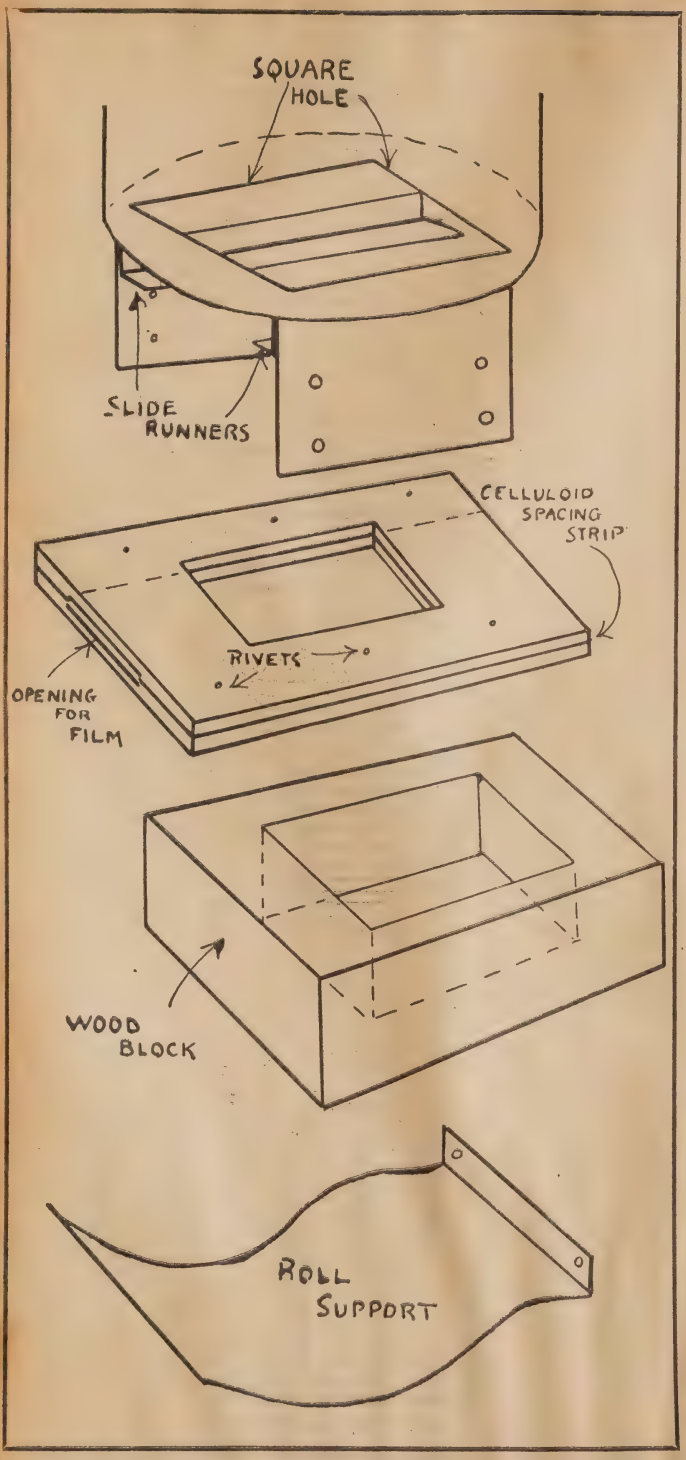
Model work—that is, beautifully-constructed models of sets—is the piece de resistance of Hollywood. The earthquake sequence in "San Francisco" was a superb example of model-work, plus montage. The hurricane scene in "Hurricane," in which an entire island was swept away by Joseph Basevi's wind-machines, and a whole church was demolished before the camera, was a further example. If we need others we have only to look at R.K.O's. "Las

(Continued on Page 67)



Another example of the use of real buildings plus models. This is the actual filming of the fire in the film "In Old Chicago," showing the framework of the city built and photographed with the human players. For the final devastation, an entire small scale model of the city was built and burnt for the cameras . . .

The same scene as it appeared on the screen. An artificial lake was dug at 20th Century-Fox studio and filled with 1,865,000 gallons of water, in which an army of extras splashed for a week.



MAKING

☆

Here is a practical article by a practical man, dealing with a subject of interest to every camera fan. As there is a fair amount of work involved in the construction, we have taken pains to illustrate the article very fully.

FOR reasons difficult to describe, radio and photography are closely allied hobbies. We often find that the chap who dabbles with radio has also a good working knowledge of photography, even if he is not actively engaged with camera work

For many years the writer's photographic equipment consisted of a ½ plate reflex and accessories, but at long last, like many thousands of sceptics, we have succumbed to the fascinations of the miniature camera.

GETTING THE LENS

For home-printing from these tiny negatives an enlarging camera becomes an absolute necessity; after scanning current catalogues and price-lists, we decided to investigate the possibilities of building our own vertical enlarger. We did, with the result shown in the accompanying photograph. At a cost of not more than two pounds we have built a vertical enlarger of which we are quite proud.

From earlier experience with the construction of bulky horizontal enlargers we knew that the first step was to secure a suitable lens and bellows, and then build the remainder around it. A "suitable lens" does not necessarily mean an expensive modern anastigmat, for we are not concerned with color correction: the simple "rapid rectilinears" will do excellent work; the important factors are covering power and focal length, small aperture merely requires longer printing exposure.

When considering enlarging cameras we must remember that the longer the focal length of a lens the greater will be the distance between lens and paper for a given size of print. For a vertical enlarger, therefore, we must choose a lens of short focal length, and thus keep the dimensions of the instrument to a minimum.

Accordingly, then, one Friday night we made a tour of the city's second-hand dealers and eventually came across the very thing we wanted—an old 2½ x 3¼ Kodak with an F 7.7 R.R. lens. The camera was unworkable, but this did not concern us, for we had the essential bellows and lens. We said, "How much?" He said, "Ten shillings." We said, "Seven and sixpence." He

A VERTICAL ENLARGER

By A. J. BARNES

said, "All right." So home we came plus camera.

The first operation was upon the old camera. This consisted of removing the back; secondly, we removed the focussing catch so that the lens panel could be freely moved along its runners.

THE LAMP-HOUSE

This consists of three tins; the condenser lens lies in the bottom of one over a rectangular opening a little larger than a negative. The next tin has both top and bottom removed and is fitted with a ventilating cap, consisting of the third tin into which a lamp-holder is fitted. The cap is supported by small bolts and spacers so that there is ample room for ventilation of the interior of the lamp-house without light-leakage.

The wife could give a good story on this lamp-house—as the search for tins of suitable dimensions can be well imagined! Possibly, the indication of the types of containers actually used may save prospective constructors considerable domestic strife. Here they are: A honey tin (2lb. size), a golden syrup (2lb. size), and a potted meat (?). We cannot faithfully describe the latter, for it was in a badly rusted condition when we found it under the house!

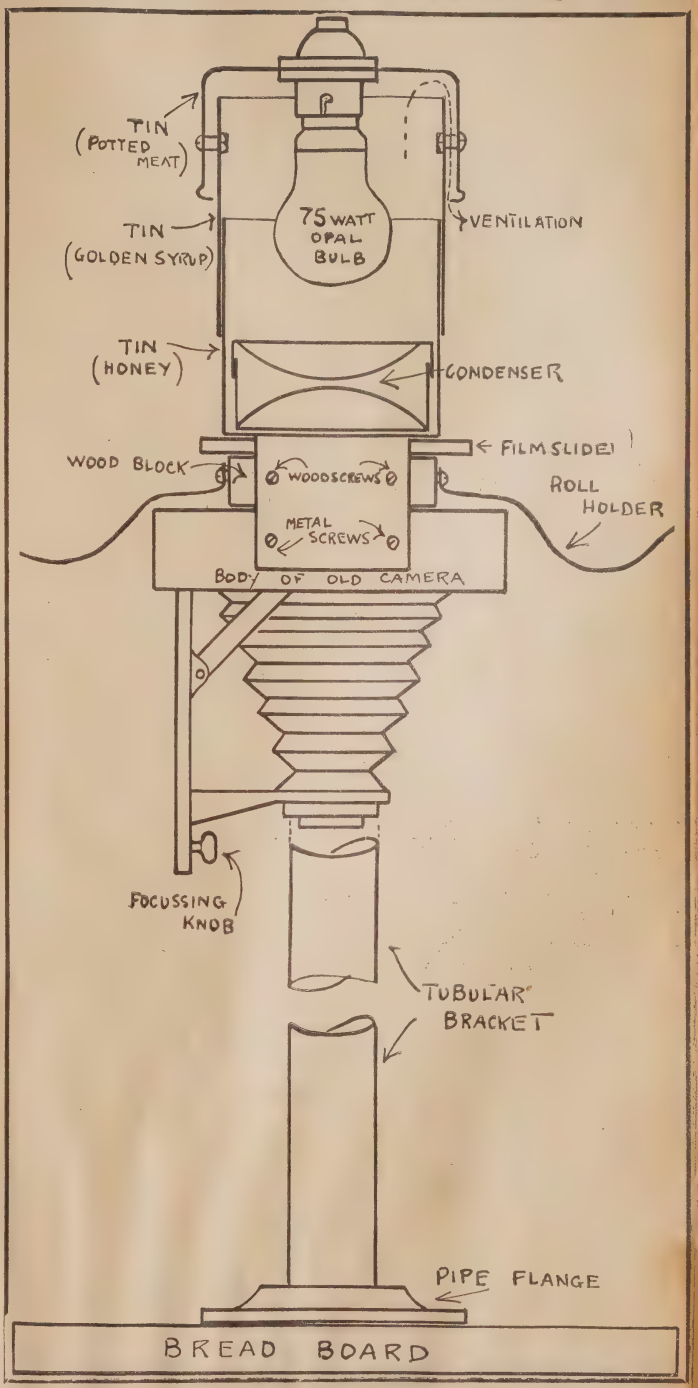
ATTACHING THE BELLOWS

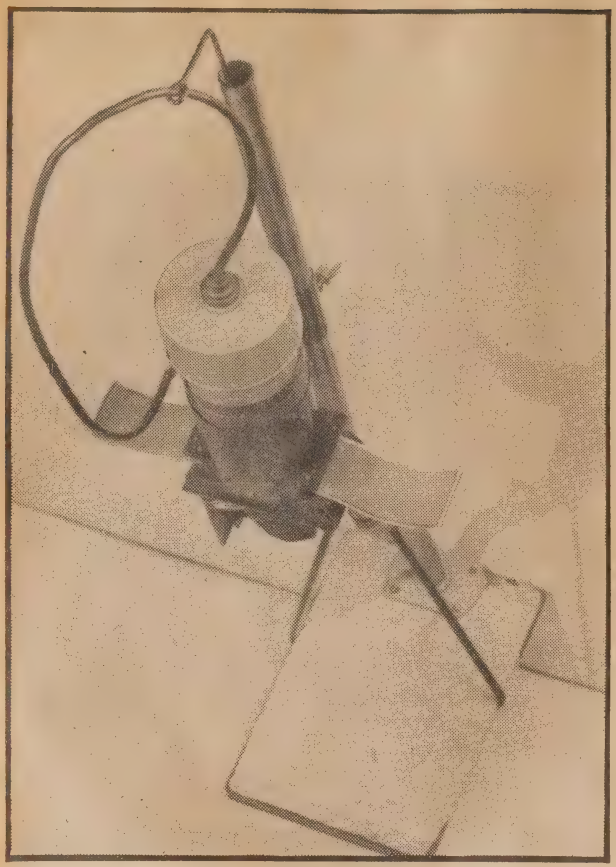
The procedure for attaching the bellows assembly to the lamp-house may vary according to the type of camera used for construction. In our own case, we soldered a pair of wide right-angle brackets to the bottom of the lamp-house, and then later attached the camera body with two 1-8 inch bolts on each side. Before actually attaching the camera body it was necessary to solder to the bottom of the lamp-house an additional pair of right-angle brackets, which formed carriers for the film slide. A wooden spacer, as well, is fitted between lamp-house and camera body, and it is to this spacer that we screw the "wings" which support the roll of film.

THE FILM SLIDE

In our case, the use of 35 millimetre film considerably simplified the construction of the film slide or carrier. We found that the film would be quite flat without the use of glass plates, so this enabled us to build a slide through which the film could be drawn without disturbing any other part of the equipment. The slide consists of two identical pieces of 1-8 inch sheet bakelite, in the centre of which is cut a hole of negative size.

The bakelite pieces are separated along each side with strips of celluloid a little thicker than the negative



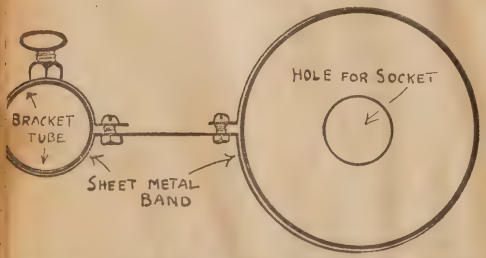


This top view of the enlarger shows how it will look to the operator. Note the bend in the supporting pillar.

aterial, and are countersunk, riveted ogether with 1-16 inch brass escutcheon ns. Each end of the slide is left ithout the celluloid spacing, and thus e have apertures through which the im is inserted and withdrawn.

ASE AND SUPPORT BRACKET

The baseboard is easily arranged for -it is a domestic "chopping" or "bread-oard," but you will require the help of cycle jobber for the construction of ie supporting bracket. This consists of a piece of steel tubing 1¼ inches in diameter and 16 gauge. The tube is cranked, i.e., bent in two pieces so as to bring the lens over the centre of the baseboard. On the bottom of the tube is brazed a pipe flange, which is screwed in the baseboard. You may notice in the photograph two braces which are not described. We originally used smaller tubing than that specified —you are getting the benefit of our experience! The tube, on completion of bending and brazing, should be dull nickel-plated to prevent rust.



Details of the bracket which clamps the assembly to the pillar.

ADJUSTING CLAMP

The lamp-house assembly must now be attached to the supporting bracket in such a manner as to allow of movement up and down in order to secure various degrees of enlargement. To do this we bend a large, wide strip of sheet iron around the lamp-house and fix it firmly with two 3-16 inch bolts. The other end of this band is clamped to a piece of steel tubing in a similar fashion. This piece of steel tubing slides over the support bracket and carries a brazed-on nut with a thumb-screw.

NOTES

Build and set up the lamp-house assembly first; this will enable you to determine the length of the support tube and position of bends, etc.

The metal brackets are made from sheet galvanised iron. The film roll supports are covered with velvet to avoid scratching.

A sheet of cardboard with a negative aperture may be required to fit between camera body and wood spacer.

Paint the inside of the lamp-house dull black in order to minimise light leakage by reflection.

Another view of the enlarger.

AN EASILY CONSTRUCTED DIFFUSER

FOR YOUR INTERIOR PICTURES

AN excellent diffuser of neat design, suitable for using with a photoflood lamp, may be made quite easily and inexpensively with the aid of a wooden embroidery hoop, a sheet of tracing cloth or paper, and three small metal clamps. The tracing cloth or paper, cut roughly to size, is clamped and stretched drum-tight in the hoop, and neatly trimmed off. The three clamps which hold the diffuser in place are fashioned from ¼ inch 18-gauge metal strip, each 2½ inches long, and are held together at their centres by ordinary machine-threaded 1-8 bolts and nuts.

As will be noted, the method of attachment allows ample space for ventilation, and disposes of any likelihood of the lamp becoming overheated. The hoop should be at least two inches larger in diameter than the reflector, to insure ample coverage.

MOVIES CAN ACHIEVE THE IMPOSSIBLE

(Continued from Page 63)

Days of Pompeii" and the fire sequences of "In Old Chicago," to mention two outstanding examples.

BACK PROJECTION

"Back projection," or process work, has become so ubiquitous in films that it has almost ceased to be regarded as a camera trick. Our own Cinesound studio has its "back projection screen" which—I am now quoting director Ron Whelan—"was imported from Hollywood at terrific cost." Briefly, back projection work consists of sending a small camera crew to Jericho, Johannesburg, or Jerusalem, and having them bring back a series of local background. These backgrounds are projected on a screen, with the projector behind it. The actors play their parts in front of the screen, moving against the animated background, and this, naturally, saves the cost of transporting the entire company to the aforementioned places.

Let us hear Mr. Ron Whelan telling about Cinesound's projection screen now in use at that company's Waverley studio. "We are," says Mr. Whelan, "the only studio doing background projection in Australia. First you have a translucent screen, costing approximately 9s to 10s a square foot. We have a special projector which has a Bell and Howell gate.

"All plates must be shot with a pilot pin Bell and Howell. They are never projected until they are required. The camera and the background projector are aligned at certain distances, ranging from 60 to 180 feet, varying according to the amount of screen you wish to use. They must be in absolutely dead alignment—if not, you immediately get a falling-off at the side of the screen. Actually, the eye of the projector is looking into the eye of the camera. The main thing to avoid is what is known as a 'hot spot,' and it is only in recent years that they have been able to eliminate this in background projection.

"Background projection," continues Mr. Whelan, "has been invaluable. We have not been on location since 'Tall Timbers' was filmed, yet we have made pictures around Thursday Island, in England, Lapstone, &c."

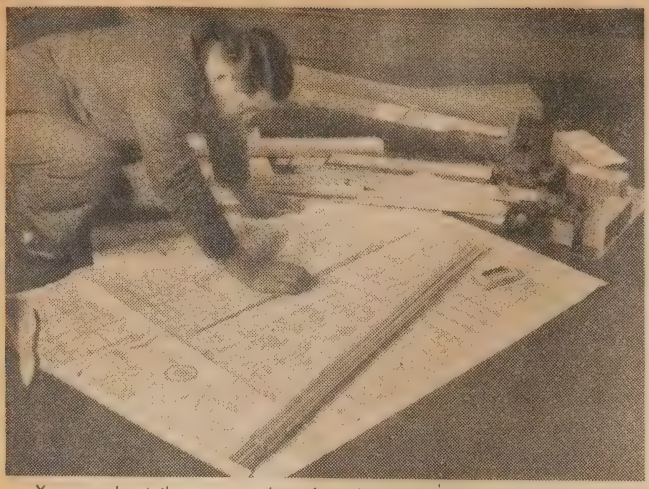
Background projection, once you know the trick, is easy to spot. The backgrounds have not the clarity of direct shooting; they are fussy, slightly out of focus (particularly in close-ups enacted before them), and several shades darker than the normal exterior.

SPIRIT PICTURES

No article on trick films would be complete without a mention of the camera magic shown in the recent "Topper" films. Here, several old tricks have been rejuvenated with new approaches. The transparent "spirits" of Cary Grant and Constance Bennett moving through marble halls are merely the result of photographing these two players against neutral backgrounds and superimposing the normal action of another set on this first film. The scenes in which Grant and Bennett gradually dissolve from view is accomplished by ordinary camera "dissolve." The shutter is gradually closed, and the whole scene melts in blankness. Again this dissolve is printed over a film showing Roland Young's dismay or astonishment at the melting figures. But the scene in which Miss Bennett or Mr. Grant disappear in the blink of an eye are surely the most effective. One second they are there—the next they are not.

This apparent miracle is accomplished by the "stop-action" method of filming first used 30 years ago. Constance Bennett, talking to Roland Young, decides to disappear. Young "freezes" in his attitude, the camera is stopped, and Miss Bennett walks out of the scene. The camera starts at the split second Young breaks his "freeze" and carries on with the acting. If you were to examine that film, on one frame Miss Bennett would be present—in the next she would have disappeared.

The simplest home movie camera can accomplish the above trick quite as effectively as the professional model just as it can duplicate quite a number of the tricks mentioned above. But a description of these tricks and the manner in which they are performed must be left until next month's article. In that, it will be shown how simple such camera magic can be made, once the essentials of the craft are grasped.



You spread out the very complete plans all over the floor, and get to work.

MY LATEST HOBBY

Model Planes With Real Petrol Motors

☆

By A. G. HULL

☆

LETTERS from friends in America, after seeing the first issue of "Radio and Hobbies," told me of the prevalence of model aeroplane building in the States. Apparently they are having a real "gas model" boom. They call them gas models because they are driven with motors using gasoline. We'll have to think up a better name for them for local use, as the term "gas driven" gives the wrong idea here.

But to get to the point, these big models are so popular in overseas countries that it is being found necessary to introduce legislation to control them.

Just imagine how awkward it must be to get a ten-foot model through your windscreen when you're driving down a country road!

The models range from three to fifteen feet in span.

Engine manufacturers claim to be turning out motors in thousands without being able to cope with orders.

Similar booms in this particular branch of model aeroplane building are reported from England and also Queensland. At the moment petrol-engined models are quite popular in Sydney, but not to the same extent as overseas.

This is how the parts for a 6-foot gas model come to you.

NOT DIFFICULT

Although the job of building one of these big models is a bit longer than building up smaller models, it is by no means beyond the ability of the average man, especially if an imported kit of parts is obtained. These kits, which are selling in thousands in the States, have been designed especially for use by the public and are just as foolproof as anything can be.

All the difficult parts are cut to shape and ribs and other parts are simply cut from sheets of balsa wood, according to the printed outlines on them. Balsa cuts like butter when a razor blade is used.

DIAGRAMS

Full scale diagrams are included in the kit and the assembly consists of putting the diagrams flat on a large table, pinning the spars according to the diagram, and then cementing them together. When the cement is dry the pins are removed and there you have the fuselage side, wing, or whatever it is that you have been working on.

I found out all this when I started to build a model a few days ago.

Following the advice from my American friends, I started to investigate the situation in Sydney, and within a few hours I found myself well and truly entangled in a new hobby, which has since held every atom of my interest.

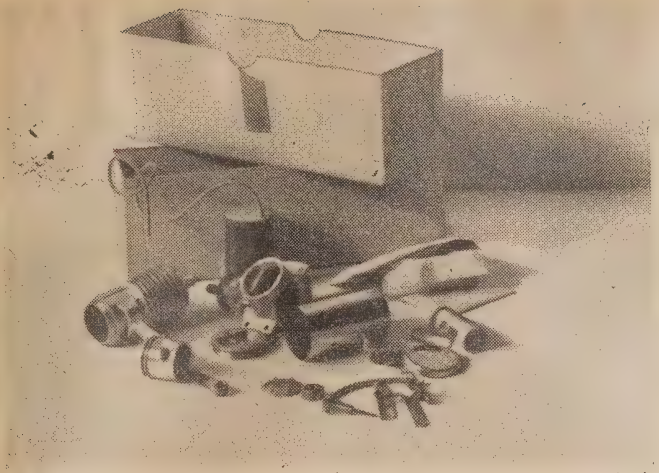
THE MOTORS

The motors used are specially built for the purpose, being single-cylinder two-stroke engines, weighing only a few ounces, and yet capable of 10,000 revolutions per minute. Ignition is obtained from a special midget sparking plug fired from a coil and condenser with a contact breaker operated from a cam on the main propeller shaft. The "carburettor" consists of an adjustable needle valve, the "float chamber" being the tank.

A typical example is the "Bunch Mighty Midget," which has a die-cast aluminium crank case and cylinder head, with steel liner, an alloy piston with two rings, and a full-floating gudgeon pin. The bore is about three-quarters of an inch and the power rating is one-fifth of a horse-power.

MOTOR KITS

The motors are available built up, ready for operation or in kit form. The assembly of the kit consists of soldering up the petrol tank, filler cap, needle valve, etc., and assembling the piston and cylinder and fitting and adjusting the contact breaker. To a man accustomed to building radio sets the job of assembling one of these motors amounts to about an hour's work. The kits cost about £4.



And these are the bits and pieces which go to make up the motor. You can see clearly the cylinder, piston, coil, etc. Note the little spark plug screwed into the cylinder head.

Within an hour of unpacking my motor kit I had the job turning over in great style on the bench in the workshop. When revving at fair speed the propeller becomes invisible, as I found out very suddenly when one of my fingers strayed within reach of its whirring blades. If it had not been for the bandaged finger I've no doubt that this story would be telling you of the results achieved with the finished model!

RESULTS

As a spectator at the competition for these models held at Dumbleton on June 11, I found plenty of interest.

The contest was what was known as a "Precision Competition," and from what I could gather the idea was to allot 20 marks for workmanship, 20 for the take-off, 20 for the actual flight, 20 for the glide to earth, and the final 20 for the landing. Some idea of the performance of some of the models can be gauged when I mention that in several cases the judges could deduct only a point or two.

In two cases, however, none of the final marks were earned, for the models were involved in most spectacular crashes. One model circled the crowd at a height of a few feet, gradually getting lower and lower. It was quite evident that sooner or later something was going to happen, and it did. As the papers would say: "The wreckage was strewn over a considerable area." In the other case the model made a fast dive into the side of a footbridge. The posts and rails divided the wreckage!

A few motors gave trouble with starting, but this is only to be expected with little two-stroke motors, and doubtless some more information on their adjustment and attention is likely to clear up this problem.

THE FUTURE

Personally, I haven't any doubt that model aeroplane building is going to boom again in the next few months.

Handling balsa wood is intriguing work, and the little baby petrol motors have a charm of their own.

The actual building of models is much easier than you expect, and it's quite a simple task to make something which you can feel quite proud about.

CLASSES FOR MODELS

IN American they have introduced classifications for petrol-driven models. There are two popular types of motors; those with a rating of one-seventh of a horsepower, suitable for models with a span of 48 inches, and the others with a rating of a fifth of a horsepower, and suitable for models about six feet across. These are grouped as the B and C types, respectively. The A rating is for motors of less than a seventh, and there is an "open" rating for motors bigger than a fifth. At present, the class C motors are most popular and are cheapest in price. There is a tendency towards the class B motors, however, and within a year or two they may be more popular.

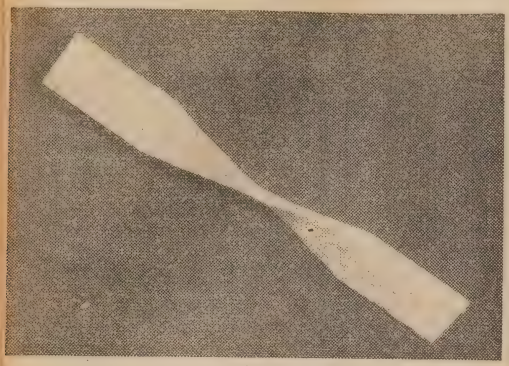
REVOLUTIONS

The small petrol-driven motors for model planes are designed to turn over at far greater speed than the real motors of big planes. The little fellows turn over at between 5000 and 10,000 revolutions per minute with ease. Their short stroke means that even at these revs the speed of the piston in relation to the cylinder wall is comparitively slow.

RADIO CONTROL

Radio amateurs will be interested in an article on radio control for model planes which is published in the May issue of "Air Trials." The article is by Clinton De Soto, well-known radio "ham" (of the A.R.R.L. headquarters staff), who has designed a fourteen-foot model for radio control experiments. Clint gives acknowledgement to help from the late Ross Hull, who did considerable work with radio-controlled sail planes before his tragic death last year.

HOW TO CARVE A PROPELLER



1.—
The blank ready to carve.

2.—
Hold the blank in the left hand and carve away from yourself.

3.—
Carve the face of the blade down and then sand in concave camber.

4.—
Turn the blank around and carve the face of the other blade.

5.—
The half-carved blank with the face of both blades carved. This blank is turned over and—

6.—
The backs of the blades are carved and sanded. This time the camber is convex.

THOSE TECHNICAL FLYING TERMS!

YOU SHOULD KNOW THEM

Even the beginner must know the meanings of a few technical terms used in connection with flying. Here are some better known terms, with a short explanation of each.

R.O.G.

Rise off ground used to denote a model which takes off under its own power.

R.O.W.

Rise off water, denoting a model seaplane or hydro.

H.L.

Hand launched, denoting a model flown from the hand, H.L. contest would be a contest for such models.

TRACTOR

Used for a model with a propeller or propellers that pull the machine forward.

PUSHER

The opposite to tractor. This type of model has its propeller or propellers behind the wing.

CHORD

The breadth of the wing or tail.

SPAN

The length of the wing or tail.

CAMBER

Usually refers to the curve in the wing section. It is measured by the height of the greatest part of the curve.

LONGERONS

The lengthwise members of the fuselage framework.

PITCH

The distance forward through which the propeller travels each revolution.

DIHEDRAL ANGLE

The angle through which the wings are raised from the horizontal. In model aeronautics dihedral is measured by the height each wing tip is raised from the horizontal. For example, if a wing had 2 inches dihedral it would mean that each tip was raised 2 inches higher than the centre section.

THRUST BEARING

The bearing which houses the propeller shaft. On stick models it consists of a bent piece of aluminium drilled for the shaft, whereas on a fuselage model it can consist of two washers, one cemented each end of a hole drilled through the nose block. An aluminium or brass tube makes a more effective bearing on larger models.

FUSELAGE

The body of the model which supports the wing tail and propeller and houses the rudder. To be properly classified as a fuselage machine the cross-section of the fuselage at its widest point must have an area equal to, or greater than (L/10)2 squared, where L equals length of the fuselage.

STICK MODEL

This classification covers any model which does not come up to fuselage specifications. However, it more specifically refers to a model the fuselage of which is replaced by a single stick or spar.

DOWNTHRUST

The amount which the propeller shaft is offset downwards.

SIDETHRUST

The amount which the propeller shaft (thrust line) is offset sideways.

TORQUE

In model aeronautics the force referred to as torque should properly be called counter torque as it actually refers to the resistance set up in opposition to the torque. However, all model builders call it torque. If a model was held by the propeller and the fuselage left free, the fuselage would tend to revolve. When both the model and the propeller are released the air resisting the propeller's spin cause the fuselage to bank slightly in the opposite direction to which the prop is turning. In model aeronautics we say this is due to torque.

WASH-IN

A term which refers to warping a wing or tail so that the leading edge is higher than the trailing edge. In other words increasing the incidence of the wing.

WASH-OUT

The opposite to wash-in. Actually decreasing the incidence.

ANGLE OF INCIDENCE

The angle of the wing to the thrust line. Although in model parlance it most often refers to the angle the wing is set to a horizontal line through the centre of the fuselage, downthrust, &c. being ignored.

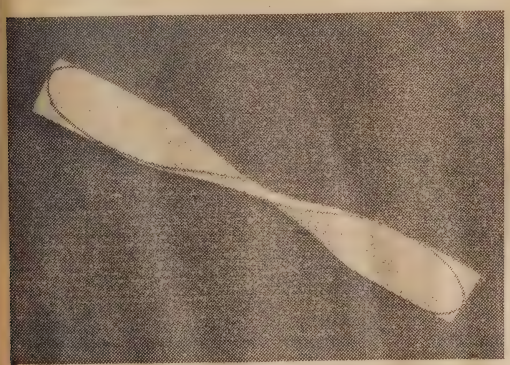
ANGLE OF ATTACK

The angle which the airstream strikes the wing. This angle should not be confused with the angle of incidence. Incidence is fixed by design whereas attack varies greatly during flight.

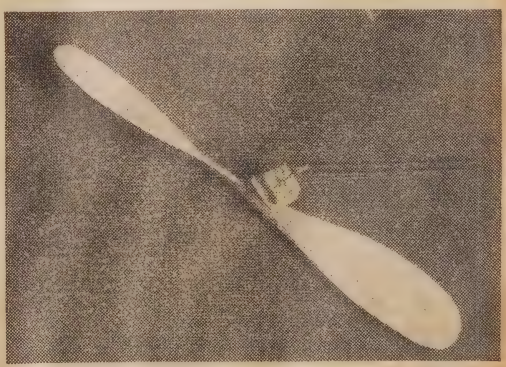
DOPE

A prepared chemical used for tightening the wing and fuselage covering. It should make the tissue or fabric airtight and watertight. Its main component is amyl acetate or for model use, full strength airplane dope can be reduced with amyl acetate.

In the next issue this glossary will be continued, and more model terms explained in easily understood language. Beginners particularly will find this series very helpful.



7.—
The rough propeller. The blades have to be trimmed to the outline shown.



8.—
The finished prop complete with shaft and noseblock. Two or three coats of dope and a polish with sandpaper and the prop is ready to go.

HOW TO SELECT BALSA FOR YOUR PLANE

Balsa wood grows in South America. It could be grown practically anywhere for that matter, provided, of course, that there was an ample supply of rain. But the South American variety is the only kind which suits model aeroplane construction.

ITS growth is prodigious, and as a result, it is very light, almost pithy. Ninety per cent. of balsa wood consists of air cells, the remaining 10 per cent. wood. Hence its extreme lightness.

The lightness depends on its growth. In a less humid climate the growth would be slower and the density more comparable with heavier woods. Actually the density of balsa wood varies from 3½lb. per cubic foot to 7lb. per cubic foot.

Because of the variety of grades both in weight and quality the model builder has to be particularly careful in his selection of wood.

ACCORDING TO USE

Wood should be chosen with its use in mind. Almost every grade of balsa has its uses, and no one grade will do every job. However, one thing to look for at all times is whiteness.

The whiter balsa is the better the quality. Of course, the strength varies with weight at all times, and very light white balsa would be useless for a propeller, for example.

Brittle wood and spongy wood have practically no value at all and should be avoided. However, do not be particularly afraid of water stains in the wood. If the wood seems otherwise good, water stains do not signify weakness.

For propellers, reasonably hard wood should be chosen. Try for the white variety with a close grain. However, watch the weight carefully, and don't buy wood solid enough for table or chair legs. Testing the wood by pressing with the fingers often serves to indicate the strength. Propeller wood should be able to resist squeezing, but you should be able to mark it by pressing, say, with the back of a pencil.

STRUTS AND SPARS

Next in strength comes wood for longerons, struts, spars, &c. This should be lighter than prop wood. A stringy grain is to be preferred, but on no account should hard brittle wood be used. If you think the wood you have chosen a little light for the job use a greater cross section than you originally intended and you'll be playing safe.

For fuselage formers, and sometimes ribs, the grain is most important. What is most required here is rigidity. The

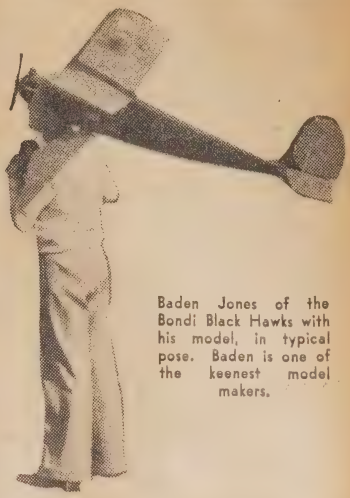
(Continued from Page 74)

MODEL PLANES

WITH "REAL" MOTORS

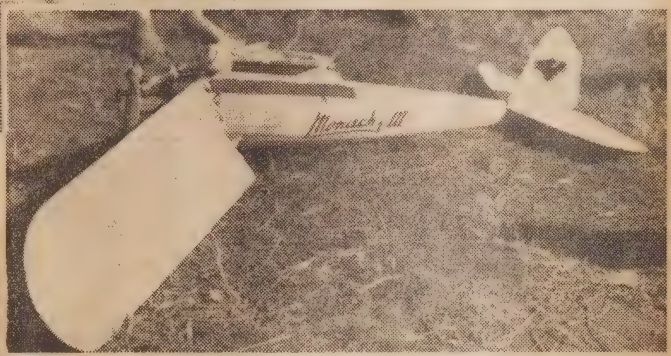
Some views of the Precision Contest for petrol models held at Dumbleton on June 11.

Below: In full flight after a perfect take-off.



Baden Jones of the Bondi Black Hawks with his model, in typical pose. Baden is one of the keenest model makers.

Right: The wreckage of Monach III, after crashing into the crowd. Such crashes are not serious and a few hours interesting work and a few shillings' worth of balsa will make the plane as good as new.



Below: G. Peters, of the Bondi Black Hawks, releases his cabin monoplane.

Left: Mac of the Western Suburbs Bats Club. The model is powered with a "Mighty Midget" motor and gave a splendid display until an unfortunate crash.

MODEL PLANES

AUSTRALIA'S WAKEFIELD TEAM

SEVEN MEMBERS

The team chosen to send models are: J. Fullarton (Bondi), J. Brown (Chester Hill), E. Cocks (Lakemba), from New South Wales; and from Queensland, C. Hazzard (Bundaberg), B. Archer (Bundaberg), and B. Scarr (Brisbane).

THANKS to the Sydney office of C. C. Wakefield, the association has been relieved of the cost of shipping the model overseas.

The contest will be flown in New York in August. Each contestant is allowed three flights, and his average time is recorded. The contestant with the highest time wins the trophy for his country and earns the right to retain the trophy for the ensuing twelve months.

The contest is flown annually in the country holding the trophy, which means that if we can bring the trophy to Australia this year, next year will see the cream of the world's model flyers in Australia endeavoring to take the trophy away from us.

USING ACETONE CEMENT

DEFINITE TECHNIQUE REQUIRED

There is a definite technique in the use of acetone cement that must be acquired before the beginner can hope to have joints that stay put. The secret is to use as little cement as possible. Start with a fairly thin solution. Incidentally, one of the advantages of mixing your own cement is that you can control its consistency.

PURCHASE some acetone from a wholesale chemist and then dissolve clear celluloid in it. The celluloid will take an hour or more to dissolve, and the thickness of your cement will depend on the amount of celluloid in the solution.

Having prepared your cement, use it sparingly. The essence of the contract is to have the cement soak thoroughly into the wood on both sides of the joint. Therefore touch both sides of the joint with a little cement, and where you have a joint that will be subjected to great strain as in the wing joint of a glider, both sides should be prepared by coating with cement, in much the same way as you would tin the components of a soldered joint.

Where a liberal coating of cement is desired around a joint it should be given several thin coats rather than one thick coat. Acetone cement dries from the outside and forms a thin sheet of celluloid; if the cement is applied thickly a skin forms on the surface and prevents the rest of the cement drying. However, if a thin coat is applied and rubbed into the wood it dries quickly and thoroughly, and several coats will make an excellent joint.

The usual manner of applying cement is by a piece of stick. However, if you like to go to a little more trouble you can fill an empty toothpaste tube with cement and then squeeze it on to the joint.

Undo the end of the tube, clean it thoroughly, and when it is perfectly dry pour in the cement. There is no need to use a screw cap on the tube. The cement will seal the opening after it is used, and the next time you wish to use it merely pierce the cement skin with a pin. In this way very little cement is lost by evaporation. And where a lot of cement has to be applied quickly, as in the planking of an all balsa fuselage, the tube system is most efficient.

SELECTING BALSA FOR YOUR PLANE

(Continued from Page 72)

wood should not be pliable, but at the same time brittleness must be avoided. Choose wood which has a scallopy appearance on the surface. If you test this type of wood you'll find that it resists bending and ensures a rigid framework.

RIGIDITY

This rigidity is not so important for ribs as it is for formers. Even on large Wakefield models, 1-32 sheet balsa can be used for ribs if it is sufficiently rigid, but on smaller models featherweight wood can be used.

Wood which is practically useless for anything else usually makes excellent planking for an all balsa fuselage. Soft, light wood, preferably with a stringy grain, is ideal provided it is not brittle. The lighter it is the better, and appearance counts, too, so avoid stained wood. Use planks about 3-8-inch or ¼-inch wide and allow for sanding. If you require an all-over skin of 1-32 sheet, use 1-16 wood and sand down.

ELEMENTARY COURSE IN RADIO

(Continued from Page 17)

shown in the completed circuit in Fig. 4.

CRYSTAL CIRCUIT

The crystal detector possesses the property of changing its resistance with changes in direction of current flow. It is easy for current to flow from the contact or cat whisker, through the crystal, but very difficult for current trying to pass from the crystal to the cat whisker. If an alternating or changing voltage is applied across the crystal, comparatively large amounts of current will flow when the cat whisker is positive, and very small amounts will flow when it is negative. The result of applying the modulated carrier wave shown in Fig. 5A to a crystal would be as illustrated in 5B, where the negative half of the modulation is almost entirely suppressed.

The current has now been rectified by the action of the crystal, but the output is still pulsating at radio frequency.

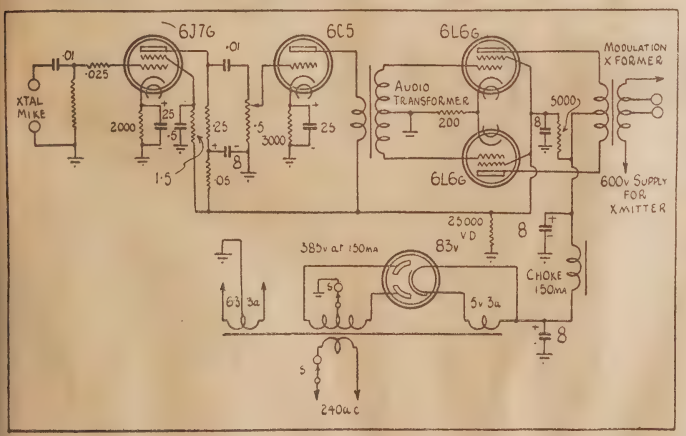
In the circuit shown in Fig. 4 you will notice a by-pass condenser connected across the headphones. In conjunction with the headphones this condenser changes the pulsating radio frequency current into movements of air, which the ear recognises as sound. The action is as follows:

Taking the rectified current as shown in Fig. 5B, the impulse represented at "A" will cause a current to flow through the phones, creating movement in the diaphragm. It will also charge the by-pass condenser. Then as impulse "A" drops back to zero the condenser will tend to discharge through the phones, keeping the diaphragm in the same position. Impulse "B," which is stronger than "A," will move the diaphragm further in the same direction and will increase the charge in the by-pass condenser. As "B" dies off the discharging of the condenser will tend to keep the diaphragm in the position to which it was moved by "B." Impulse "C" will still further increase the condenser's charge and the movement of the diaphragm. When impulse "D" comes along, only a small amount of charge will be applied to the condenser and only small amounts of current will flow through the phones. The diaphragm will spring back to a position determined by "D."

The diaphragm moves roughly in accordance with the edge or amplitude of the modulated carrier wave. As this amplitude is determined by the original audio sounds, in the broadcasting station, we have succeeded in transmittng and receiving sound by radio.

The next article will deal fully with the operation and characteristics of coils and condensers.

FIVE-METER TRANSMITTERS (Continued from Page Forty-four)



A suitable modulator for the 5-meter transmitter.

until the valves are drawing something like 50 mills the pair. The grid leak is 75,000 ohms 1 watt.

The conventional hairpin aerial coupling arrangement is used, and the aerial can be two straight rods about 2ft. long for each section. Exact measurements can be worked out for any frequency. If twisted pair feeders are used, don't make them too long. We haven't worked out any critical length, but 20ft. or more will probably cause heavy losses.

Any modulator capable of about 6 watts can be used with it for phone work. The maximum current it should be allowed to draw under load is about 70 mills. You will get plenty of aerial current at this setting.

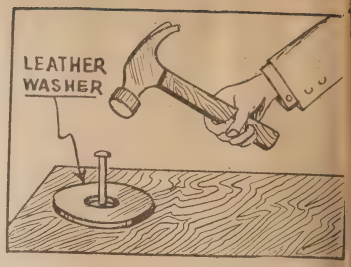
HANDY HINTS
FOR YOUR WORKSHOP

By W. G. NICHOLS

PREVENT DAMAGE TO WOOD WORK WHEN NAILING

WHEN doing carpentering work around the home, a slip of the hammer may result in an ugly dent in the wood requiring a good deal of time and care in patching up.

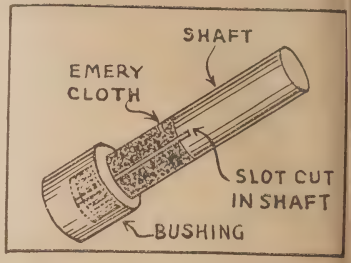
This accident can easily be avoided by the use of an ordinary leather washer placed over the nail, as shown in the illustration, a misplaced blow of the hammer landing on the washer and thus saving the woodwork from damage.



REAMER SUBSTITUTE

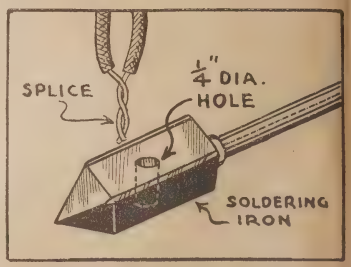
THE time will often occur when the workshop enthusiast finds himself without the correct size reamer for the job on hand, but the job can be gone on with by the following hint.

Select a piece of metal rod slightly smaller in diameter than the hole to be reamered, split for half of its length and spread slightly. Wrap with emery cloth as shown in sketch; place in drill chuck, and your reamer is ready to operate.



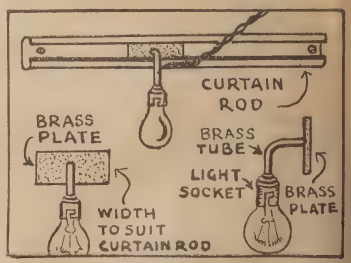
HANDY SOLDERING KINK

SPLICED wires are easily soldered if a heating pot and ladle are available, but a ¼in. diameter hole drilled in your soldering iron, as illustrated, will solve the problem for all time. Half fill the hole with solder. Flux the wires, and dip them into the solder.



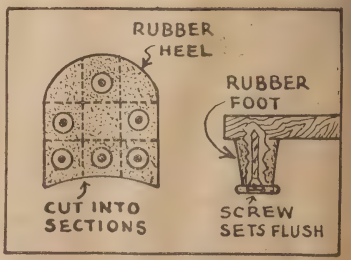
SOLVING THE LIGHTNING PROBLEM

PROCURE a flat type curtain rod and fix to wall at back of workbench. Cut a brass plate that will fit and slide snugly in the curtain rod. To this plate, solder a piece of ¼in. brass tube bent at right angles. Make sure when bending this tube to allow plenty of clearance between them from the back wall to the light bulb. Fasten lamp socket to tube, taking the flex from the socket through a hole drilled in side of tube.

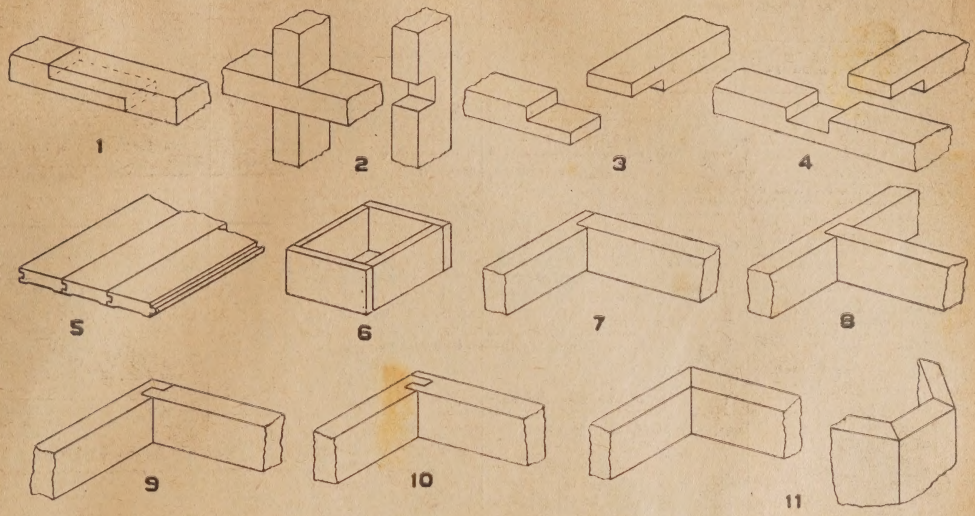


RUBBER FEET FOR LABORATORY GEAR

IT is always advisable to mount rubber feet on radio instruments and bench cabinets, both to prevent the bench from being scratched and to protect the instruments from vibration and jars. These can be easily and cheaply made from rubber shoe heels cut into sections, as per sketch, and then pared to a cylindrical and slightly conical shape, using a razor blade for all cutting, and then smoothing with sandpaper.



HOW TO MAKE JOINTS IN WOOD



1 Half Lap Joint
2 Cross Lap Joint
3 End Lap Joint
4 Middle Lap Joint
5 Tongue Groove Joint
6 Butt Joint
7 Rabbet Joint
8 Dado Joint
9 Dado & Rabbet Joint
10 Dado Tongue & Rabbet Joint
11 Mitre Joint

COMMON WOOD JOINTS

A HANDY GUIDE FOR HOME CARPENTERS

Making joints with wood is a very simple matter—until it comes to your turn. Then you will begin to ask—which is the right way considering the neatness and strength of the join I need?

HAMMER and nails, and a lot of hope, or a systematically made joint, a slick of glue, and a brad or two to hold the work together?

There are ways and ways of making joints. Some of these ways are applicable only to the man who has the tools to cut the necessary cross-sections; but most of them require nothing more elaborate than a tenon saw and a good chisel.

The illustrations shown above will make a very handy reference chart when you are wondering what joint will best serve your purpose.

SIMPLE METHODS

The first is a very simple affair. The second shows how to cut two pieces which make a cross joint. The third illustrates the overlap between two ends meeting at right angles. The fourth shows the termination of a cross piece with a main member. All these are simply a matter of careful measurement and marking, cutting to depth with the saw, and removing the unwanted block with a chisel.

The fifth picture shows a tongue groove joint used often in flooring to bind the planks together. The sixth is self-explanatory—just the good old hammer and nails. The seventh is a simple rabbet joint for two ends, and the eighth shows the same idea for a cross member—the dado joint.

MORE COMPLICATED TYPES

More complicated types are illustrated in the ninth and tenth illustrations. These are more often used in glued cabinet work than in the everyday jobs to be found round the house, but they are very strong.

The two pictures in Fig. 11 show the simple mitre joints. They are of the concealed type, in that no "end" can be seen, and they are usually supported from behind with suitably cut blocks glued into position.

USING GLUE

Wherever possible, the joints should be glued, and placed in some kind of a cramp, so that they are under pressure until dry. If this is not possible, see that the surfaces are as near a perfect fit as possible, then use good glue, and not too much of it. You want to glue the wood, not to simply fill up the faces with the glue. A thin brad, which may later be removed if required, can be driven in to supply the pressure while drying.

Ordinary carpenters' glue may be used, and there are one or two very good specially prepared glues which are particularly effective for small jobs, without the necessity for a big glue pot.

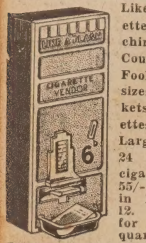
Care taken over preparing your joint, and the use of good and correct tools, is well spent, for a poor joint is almost worse than none at all.

For Radio Kit-sets featured in this issue Levensons guarantee a Sane Profit Price. Call, write, wire or phone us.

VENTRILLO, 1/-. Learn how to throw your voice. 1/- buys a double-throat Ventrillo Roof of Mouth Whistle and explanatory Booklet.

Boys! Buy a Seebackscope for 1/3. See what's going on behind your back.

Extendable Periscopes, 3/6. See above the heads of crowds from behind trenches, walls, and fences.



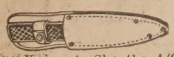
Like-a-Flash Cigarette Selling Machines, for Wall or Counter, All Metal, Fool Proof. Two sizes, holds 18 packets of 6d cigarettes. Price, 45/-. Larger size, holds 24 packets of 6d cigarettes. Price, 55/-. Special price in lots of 6 and 12. Traders, write for fullest details quantity lots.

Cameras from U.S.A. Candid 32/6, Pickwick 42/6. Write for full list.

Play, Talk, Sing, Joke through your Radio. Great Fun. Batteryless type Microphone for Hand Holding or Hanging, 22/6. Complete with lead, fixed in a second. Others, 12/6, 15/-, 17/6, 25/-, 28/6, 32/6. All plus 1/9 for Battery and 17/6 for 20ft. Cord. Write for Detailed List.

B.G.E. Table Type Microphone. Highly recommended for Amateur or Professional use. Built-in Transformer and Battery with Volume Control incorporated. Just plug into pick-up terminals of any set. 39/6.

Crystal Detectors. A1 Semi-fixed Type Midget, Glass Enclosed Type, 2/6. Continental Type, with plug-in pins and sockets, 3/9.



Hunting Knives in Sheaths, 4/6, 5/6, 7/6, with Horn Handles, with Metal Handle, 7/6. Remington U.S.A. Cowboy Hunting Knife in sheath, 10/-.

The Great Nut and Bolt Trick, 2/-. Jafet's Pocket Wallet; notes, stamps, coins, and small articles disappear and reappear. 1/-.

Giant Cigar, 1/-. Looks like a real one. Smoke a cigarette inside it.

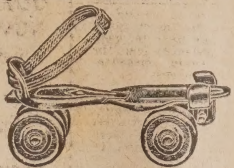
The Shy Lock, only opened behind your back. Send 10/-, 15/-, or 20/- for surprise parcels of Tricks, Puzzles, and Jokes.

Special Prices to Wholesalers and Retailers.

Morse Code Keys, as illustrated. Adjustable all ways, 12/6. P.M.G. Type, 19/6.
Buzzers, 2/6, 2/9, 3/6, 7/6.

Morse Code Practice Sets, with Switch Buzzer to Light. Use as you desire, 22/6 No. 2.

British Built All Metal Ball Bearing Extension Skates, 16/6.



Extension Ball Bearing Skates, Steel Wheels, 15/-. Made in America.

Revolver, just like the Real Thing. Combination Chromiumed Cigarette Case and Lighter-Revolver, 5/6. Novel Revolver Cigarette Case, pull trigger, out jumps cigarette, 3/6.

The American "G" Man's Gun. Hear the Siren when you pull the trigger. 2/11.

Graphoscope. Learn to Draw. Copy small drawings, photos, pictures of all kinds. 8/6, with directions.

Off with his Head. "Hindu," the Magic Head Cutter, cuts through steel with a sword of metal. Uncanny. 2/6. How's it done?

Model Electric Motors, work off wet or dry batteries, 5/9, 8/6, 12/6. Other Models, 2/6, 3/6, 5/6. Small Kits, 2/-. Outboard Electric Model Motors, work as above, 12/6, 19/6.

Totem — A Little Gamble for Home, Club, Bazaar, or Fete, 21/-. Push Lever, wheels spin for winners and odds. Write for Fullest List of Games.

Write for full List of Radio Testing Meters, English All in 1 Meter. Reads everything in Radio. 18/6.

WATES' ORIGINAL POCKET METER—4 RANGE TYPE.
Reads—0 to 6.
0 to 15.
0 to 180 Volts.
0 to 30 M/A. 14/-.

Small Pocket Meters, reads A and B Batteries, 2/6, 3/9.

Radio Kit Sets in this issue. Write, call, wire or phone for our price.

The All American All Station Crystal Set, with variable coil. All Parts 23/6, Assembled 32/6, in Cabinet 43/6. Phones from 10/6. Charts 6d; free with kit.

"PRESTO" THE MAGIC BOX. The most Amazing Trick. Just Out.

"PRESTO" — The greatest, most alluring and outstanding little Trick ever introduced, 2/9, Post Free. Money Back if it's not the best yet.

Chinese Checkers, the new pastime game taking Australia by storm, 2/6, 4/6, 8/6.

RADIO AND HOBBIES BOOK FEATURE, BUILD THEM YOURSELF RADIOS.
The Economy 6 Battery Set Parts, 126/-.
Valves 91/3, Batteries 47/-.
10in. Permag. Speaker, 55/-.

"THE SKY HOUND" 6, DUAL WAVE RADIO.
Parts 166/8, Valves 71/11, Speaker 27/6.
"LITTLE JIM" 1-VALVE BATTERY RADIO.
Parts 35/5, Value 15/3, Battery 7/3, Phones 10/6.

"LITTLE JIM'S" MATE 1-VALVE BATTERY SET.
31/5, Valves 13/6, Batteries 11/-, Phones 10/6.

The Single Valve All Wave Battery Set, using Triode Valve Parts. 44/8 30 Valve 11/-, Batteries 11/-, Phones 10/6.

The Duplex Single Valve Dual Wave Battery Radio, Parts 58/-, Valve 13/6, Batteries 11/-, Phones 10/6.

2-Valve All Wave Battery Set, using Triode. Parts 59/-, Valves 22/-, Batteries 11/-, Phones 12/6.

Amateur 3-Valve Electric Short Wave Radio, Parts 150/6, Valves 51/10, English Phones 19/6, Permagnetic Speaker 23/6.

Midget Crystal Sets, 15/-, pocket size—not toys, real radios. Set Phones, Aerial, and Earth, 22/6.

Imitation Revolvers 3/11 each, with Revolving Chamber, 5/6, made in U.S.A. Frighten off the toughs. Exact imitation of Real Revolvers. Cowboy 6-shooter Model with Flash Pearl Handle, 7/6.

Darts Board, 3/9, 5/6, 8/6, 10/6, 25/-, 39/6. Brass Competition Darts, Set of 3, 4/6 and 5/6.
Dart Boards, 3/6, 5/9, 8/6, 25/-, 35/-

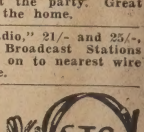
Write for full list of Model Plane Kits.

British-made Flying Model "Frog" Aeroplanes, 9/11. The World's Best.

The New York Exposition's Greatest Novelty—Dancing Dinah and Dan, 10/6.
Tap Dancing to the tune of your radio, gramo., whistle, etc., etc. It's a wow—a-a-a-a! 3,000,000 already sold in U.S.A. Introduce it at the party. Great fun always in the home.

"All in One Radio," 21/- and 25/-, for use near Broadcast Stations only. Just clip on to nearest wire or metal fixture.

S. T. C. or B.T.H. Phones 30/-, Lissen 19/6, Like-a-Flash 15/-. Other Junior Types, 5/6, 6/11, 9/6.



500 Assorted Foreign Stamps, 2/6. Write for full list of Foreign Stamps.

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Games, Hobbies, Novelties, and Slot Machine Specialists,
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Everything from A to Z in Radio at Sane Profit Prices. 'Phones, M2525 and M2526-7. Goods forwarded C.O.D. Post or Rail (C.O.D. Rail Within N.S.W. Only, Not Interstate). We Welcome Prepaid Telegrams and Long Distance 'Phone Calls. Send 2d Stamps now for Special Interesting Bundle of Illustrated Literature.

ANSWERS TO CORRESPONDENTS

MAGIC

A. Springett (Willoughby): Have sent you any names, as suggested. If unsatisfactory, rite again. Would suggest offering at least nall fee in order to defray personal expenses performer.

R. Coundon (Watchupga, Vic.): Thanks for ood wishes. Ventriloquism is not difficult to arn, providing you give regular practice to Names of books forwarded together with her information.

K. Coyne (Laidley, Q.): Thanks for letter. lad you like tricks suggested. Tricks you ention are not expensive. Will find out and rite.

E. C. Forsyth (Magill, S.A.): Thanks for long tter. Will write when ascertain information. rry about illness. Suggest magic drawer ox or dove pan for production instead of hat. ill send list. Write again.

J. A. Love (Nethercote, N.S.W.): Mango Tree rick is correct name. Special article will explain this in August issue. India is correct.

N. Hooper (Kensington, Vic.): Glad you wrote pen-friend; keep it up. Congratulations performance. Send photograph. The ugust issue will have something about the Rope Trick." Will write.

M. C. Taheny (Warooka, S.A.): Will send book nd catalogue. Write.

D. F. Besi (Turramurra): Thanks for good ishes. Glad you like the journal. Congratulations on show. Nearest club is "The IMPS," ydney. Address posted. Glad to get tricks rom you. Write again.

L. Hopkins (Kew, Vic.): Sorry about illness. lad you like book. Thanks. Glad to hear rom you again. Will post list.

A. J. Ferme, (Windsor, S.A.): Thanks. Will end list later. Glad you like conjuring rticles and puzzles. Try the one this month.

RADIO

S.V.M. (Gympie): Sorry, but we don't keep he circuits of commercial sets, particularly ones as old as yours. Suggest you write to he factory, and ask their assistance. Can't suggest any other way out.

R.H. (South Yarra): Twin triodes should oscillate just as readily as any others—our experience with them has been very successful. Hard to spot the trouble in your set without circuit, although the choke itself mightn't be a good one.

E.W.L. (Burrangong): Sorry, but we can't possibly handle the special circuits even in a simple way. Life these days is getting too rough altogether!

N.V.J. (Brisbane): Can't promise the circuit, but something like it may turn up. Please repeat your first queries, as the letter will probably be destroyed by this time.

E.R. (Townsville): Yes, leave the connections as they are. There was, unfortunately, a slip made in the original diagram. Glad you like the receiver, which seems to be doing fine.

R.L.T. (Yerong Creek): Yes, we'd like to have all the details on the electric fence. Several readers have been asking for something like that. Sorry we haven't the details on the propeller, although there is quite a bit to the calculations you mention.

A.F. (Toowoomba): Yes, you can connect up the speaker. It would be wired in parallel with the present one, in the primary circuit. Use one of, say, 20,000 ohms input impedance, to avoid too great a change in the output valve loading. Thanks for your good wishes.

T.C.B. (Parramatta): The coil details given in your circuit would probably work out quite well, without any alteration.

H.A.T. (East Brunswick): A set of the type you require will be found in this issue under the name, "Junior Radiogram Eight."

C.K.P. (Kalangadoo): We suspect your coil assembly. Suggest you send it back to be checked. It may not be suitable for the converter valve used in this set. Specially designed coil was required.

G.P. (Eastwood): Yes, you can get the base for the R. and H. Portable from practically any well-known radio dealer. The standard type of 2-gang condenser was used in this receiver.

AN APOLOGY

We very much regret that even setting the answers to correspondents in small type has not allowed us to print replies to all the letters we have received. Our mail-bag is getting so heavy that we will have to devote more space to this part of the paper in future issues. So we hope you will please be patient with us. Providing you with eighty pages of live material every month is a much bigger job than you could possibly imagine. We are trying hard to see that no letters are left outstanding after each issue goes to press. Please make your requests as brief and to the point as possible, and mark them clearly "RADIO AND HOBBIES" at the top of the sheet. Keep them on one sheet if you can, and it's easier for us if you number them. Sometimes this is a great help in answering.

E.M. (Carwarp): Can't give an opinion on the details of the fence without some experiment and thought. Thanks very much for the dope—may be able to do something about it some day soon, if time allows.

"Learner" (Ashgrove): No. 2.5 volt equivalent of the 6B7S. Use separate 6.3 volt filament transformer. Other equivalents O.K. Output valve O.K. No. 47 output would not do without circuit alterations. There is no screen in the 6A3—that was just a slip. Circuit diagram otherwise is the one to follow. It is essential to earth one side of the heater winding, or centre-tap, to avoid hum. Omission of filter choke O.K., with slightly greater residual hum.

H.G. (Ryde): The eight-inch speaker would not fit in the Portable, unless you had the cabinet made a little taller. Measure the overall diameter of the speaker, and specify the cabinet with the battery compartment high enough to get it in. Otherwise, it should be O.K., provided it doesn't take too much room at the back. If it does, you may have to make it a bit deeper as well, in order to get the batteries packed round it. Again, measurement is the only course we can suggest.

C.F.J. (Mosman): The circuit would work all right, but not as well as the original Portable hook-up, naturally. If you use 90 volts total high tension, the R.F. screen and plate could be tied together. Otherwise, tap the screen to the B battery—90 volts.

N.V.J. (Brisbane): Thanks for your nice letter and good wishes. Don't think you can do much with your set, which is not a very selective one, and unless it is made larger there is not much chance of separating the powerful locals, especially if you are in a bad spot.

"A Regular Reader" (Toowong): Afraid an article on an electric cinema projector would be rather a tall order for the home builder, and it would appeal only to one or two. Sorry, but if we thought it could be done well, it would have a chance. But there is more in these things than you might think.

"Constant Reader" (Gladstone): As we don't get any noticeable interference from the plugs of the car when using the portable, we don't think you will get much from the launch. If you keep the set and the aerial as far from the engine as possible. If you do, a suppressor would be worth trying. Glad you like RADIO AND HOBBIES. Yes, the Portable set has proved a real winner.

R.W.K. (Geelong): The T.R.F. tuner of the new set would make it superior in the reception of broadcast stations than your present receiver, considering the locals only, although range would be very much less. You will find a push-pull circuit incorporating the best points of the new set in this issue. You may be able to receive the stations without interference, but it depends on many things. Can only suggest that you try and see. A wavetrap is pretty easy to instal, and should do the job nicely if it should be required.

N.N.R. (B.V. Line, Q'land): Glad you think RADIO AND HOBBIES is worth twice the price. Yes, the coils made by the firm you mention will be suitable for the Portable set, which will take the large sized intermediates if necessary.

J.S. (Rockhampton): If your set works O.K. the way you have it, leave it wired like that. Possibly the condenser you are using has a high minimum capacity, which will prevent it from tuning as low as with a more modern condenser. If you used the latter type of 0038 mfds., you should be able to cover all the stations with the 00005 mfds. aerial condenser. The larger the aerial the smaller this condenser must be to get full coverage over the dial.

C.Y. (Shanghom's Creek): We doubt if we could spare the space to describe in full a 32-volt set, as the call for such a receiver is comparatively small. There are now so many ideas we want to talk about, in which many of our readers will be interested, that we almost despair at times of getting even half of them into the paper. Wish we could handle about 100 pages a month, but we would have to buy bigger machines to go any further than at present.

W.D.G. (Victoria): Sorry we haven't the plans for the key of the type you mention. We will try to persuade Alf Barnes to do something about it as soon as we can.

K.A.O. (Tasmania): Please obtain one of the latest valve data sheets from your nearest radio store, or valve distributor, which will give you the connections for the 6K8G. They are actually the same as the 6A8G. Most of the coil units made now will go down to 1600 kcs. if you line them up that way. Thanks very much for your good wishes. Yes, we have now quite a formidable list of subscribers, to say nothing of the people who buy from the bookstalls every week.

D.T.M. (Ultimo): The motor-boating may be due to many causes, but it shouldn't worry you any, unless you are fond of playing your set like that. Have you tried an 8 mfds. electrolytic across the tapping for the oscillator plate supply? You don't say anything about the circuit you are using.

J.M. (Northwood): You will find the 5-meter converted a very good one, and we draw your attention to some further hints about it in this issue. If you know enough about aerials to be familiar with the 8JK beam, you will know of several others. The "Signal Squisher" (that's a legitimate name, you cads, and not my sense of humor—Tech. Ed.) appeals to us as being a good one, but it's not much use, nor are any other beams, unless you can rotate them. Articles on beam antennas will appear in due course in RADIO AND HOBBIES; but we can't put them all in at once!

R.C. (Erskineville): As far as we remember, we never published the data on this converter—it was built round a special manufactured coil. R.C.S. will probably still be able to supply you with the correct coil.

W.R. (Yass): From memory, 2BL (1923) was the first licensed broadcaster in Australia, although it would be almost impossible to say which was the first actual station. The call-sign you give is, we understand, used by a commercial station for communication with trawlers, etc., round the coast, and operated on about 197 metres. Many thanks for your very kind remarks about RADIO AND HOBBIES.

H.H. (Parkes): Very sorry, but we can't send diagrams by mail. In your case, the diagram supplied should be quite clear, and if you can't follow it, we don't like your chances of getting the set to work. What about asking your local radio man? He should be pleased to help you out in so small a matter.

E.McK.N. (North Sydney): We would hesitate to describe gear for detecting metals underground, in the absence of opportunity to do some experimenting. The subject is not one to be treated too lightly, as many things are involved. Too bad if you were led astray, only to dig up the local water-main, for instance! Seriously, the only dope we have seen is that published in American magazines from time to time, but we have never made one work, or heard of anyone who has definitely proved that the idea is practicable. We should be glad to hear from any reader who has been successful with such apparatus.

R.D.X. (Victoria): It would be almost impossible to say whether you would get the Melbourne stations on Little Jim, without interference. The chances are that you would get most of them, but those close to your local would probably be rather hard. Little Jim wasn't really meant for situations such as yours.

F.W.W. (Rockhampton): We haven't got the copy handy at this moment, but, in general, if the device uses an A.C. transformer, you could probably make it work by specifying one with 240 A.C. input, and output as specified in the article. If no transformer is used, we don't advise you to try it, as the use of 240 A.C. on electrical devices without a transformer is definitely bad practice, and dangerous as well.

P.W. (Pooncarie): Yes, there seems no reason why you should not use the audio end of the Stereoscopic Seven as a battery amplifier. A fairly high-gain mike should be used—preferably one of the carbon types.

A.R.T. (Injune): It is a difficult matter to estimate the cost of receivers, as these can vary so much according to the quality of the material used. You may find some stores will quote one price, and others another, because their ideas of what constitutes good material may vary. We suggest that you send the list of parts to your radio store, and ask for a quote. This would have to be done, anyhow, and wouldn't be much trouble. You would then know just how much you would be required to find.

D. MacB. (Red Hill, S.A.): You will find some small set circuits in the June issue of "Radio and Hobbies." One of these should be just what you want. The grid leak and condenser were omitted from the 2-valve diagram—an obvious slip which won't fool you, we know. You can get the speaker from any radio dealer if you ask for it, as it is quite a standard type. If you get very strong signals from the little set, the speaker might work fairly well.

M.H.H. (South Brisbane): No, it's not a scheme to use the 6F7 as two I.F. amplifiers. The triode valve isn't very successful when used as this way, and we don't advise it. Some day manufacturers might bring out a double pentode, but we would think the spacing of the elements would make it too unwieldy—also, there would probably be coupling effects between the two sections to cause instability. The idea for the best oscillator, making an I.F. stage oscillator, is O.K., but not the best practice.

M.G. (Manango): Yes, the Master Six would be just as suitable for Stereoscopic reproduction as would be the Seven. As you say, it has tons of gain and output. Yes, you could arrange a separate switch to cut out the filaments of the first three valves when using it with the pick-up. Glad to know that you get such good results with the pick-up. No, we can't see why you shouldn't remove the valves when using the pick-up. The audio circuit is quite independent of them, and you would save quite a bit of battery drain. Your suggestion for a battery-operated transmitter isn't a bad one, although there are many snags to it. So many fellows in the country have their own ideas of getting power that one design may not suit the lot. Still, we might have something to say on it some day. What do you say, fellows?

R.G.P. (Trangie): Little Jim would be more convenient and handy, but the All-wave circuit would be more flexible, and you could have more fun with it, because it will give quite good reception on short waves. You must please yourself about this. On the broadcast band the reception would be very much the same.

A.W.S. (Randwick): Yes, you can use condenser reaction and an audio transformer with a .19 valve. The Duplex Single, one of the most popular small sets ever to be described, used just such a scheme. Thousands of these have been built over a number of years, and it still remains a best-seller. The only description we have of this set is in one of the older Call-Sign Books, one of which we will send to you on receipt of 6d in stamps, accompanied by your request for it.

R.D.W. (Erindale) asks us not to laugh, but who could help it? He suggests an electric fence for caterpillars, to prevent their wandering away when no one is looking. Apart from the fact that they should be brought up much better than this, we haven't investigated the relative conductivity of caterpillars, so it's rather a tough job to make a suggestion here. Also, do you really think—mind you, without being nasty at all—that the caterpillars would be intelligent enough to know what it was all about? Friend, what about some B batteries in series, until you hit enough voltage to keep them at bay. Lay a metal strip so that the poor things will make good contact for the slaughter.

M.M.S. (Wallendbeen): Mind you, we haven't built an amplifier for this purpose, but we would suggest one like the Stereoscopic No. 7, but with a pentode for the first amplifier instead of a triode. Take great care to filter out any hum from the first stage, and wire the volume control in the grid circuit of the driver, instead of the first valve. This will prevent hum from this stage being amplified to the full all the time. You should get the required output from this circuit, which would have tremendous gain. The output would be quite clean up to 10 watts at least.

A.S. (Tweed Heads): Many thanks for just writing to say how much you liked our paper. So far, no one has written in to say that it doesn't. That's too bad. (No, no, don't go and spoil things! Put that pen away!)

F.D. (Adaminaby): The 6D8G is a pentagrid converter similar to the 6A8G, but with 6 volt .15 amp. filament, as have all the other. The 6S7G is the super-control pentode of 6T7G is the duo-diode triode, and the 6G8G the duo-diode pentode. This last valve has .3 amp. filament, by the way.

B. McG. (Wolumla): The circuit you have sent is O.K. Just leave the diode alone, or connect them, one to each filament pin. You will need to use a variable 5-plate midget condenser in the aerial lead, if no aerial coil is provided. Thanks for your kind wishes for RADIO AND HOBBIES.

O.G.D. (Rowena): Thanks for your suggestion. We are considering the production of a cheap radio, but to date have done little more than work out a couple of designs. It isn't forgotten, however. Almost any battery set could be used in a car, as you suggest, with good results. The Portable makes a grand little car set. However, although its range and output are good enough for most cases, they would not be quite as good as those of a properly designed car radio. Unfortunately, the Seven is not suited to pieces, and will be found in the inside of several other receivers.

F.J.M. (Can't read address): You have broached a point on which we could say much, but it wouldn't get us anywhere. We have often doubted the effective audio response of many local stations, but should we mention names we would be certain of a hot and unfriendly letter from the chief engineer, claiming that the station mentioned has flat response from here to there, and that we couldn't possibly know what we were talking about, being ignorant. If we take all their assurances as being correct, we still can't explain how the all sound so very dissimilar, and how some are so much better than others. So we can not even suggest that a flat response to 500 cycles is right for all stations. Do you mind if we skip it? We do not know whether Europeans on the high wave lengths are receivable in Australia.

W.S. (Fairfield, Q.) writes to say that Little Jim's Mate is the best set he has ever made, and that it works the loud-speaker quite well. Glad to hear it, and all the best for your success with it.

H.G. (St. George): No; the difference in filament current is so small that it would not bring the drain low enough for the air-cell. We didn't worry so much about the drain with this set—it was performance we were after. We certainly got it!

B.H.V. (Newtown): You will find some circuits of the type you want in the June issue of RADIO AND HOBBIES. The special service of reply by post is not in operation now, and those who still send in queries will have to take their chance of time being available to attend to them. We can no longer guarantee to reply to them by return mail.

D.N. (Lismore): Afraid we can't help you very much, although if you write to Mr. Waters and ask him, he may be able to dig out some details for you. The expression also new to us, and we don't exactly follow the description it implies. Thanks for your good wishes.

C.C. (East Malvern): No; the condenser in series with the oscillator grid lead is a fixed type of .0001. There is no padder in the circuit—the tuning condenser, variable, is connected across the oscillator coil. You could get the converter working without using a coupling coil—just feed the output from the top of the choke. Lekmek make a special coil for this, which you can get on application. Hope this clears up the matter.

J.H. (Coolac): Thanks for your appreciative remarks about RADIO AND HOBBIES. You can get the parts for this set from any of our advertisers, who have all sold them in large numbers.

R.F.P. (Armadale): Thanks for your letter. Strangely enough, the enlarger you asked for is described in this issue. So that's that!

F.N.S. (Bendigo): The audio transformer used in the modulator for the 2JU transmitter is an ordinary A class type, and may be obtained at most. We can't remember without turning over the chassis the exact make of the one we used, but it definitely is not the B class type with which you are evidently familiar. It is, as you say, often done to specify the ratio of such a transformer in primary to half secondary. In this case, however, it doesn't matter very much. We have used transformers in similar circuits ranging from 2 to 4½-1.

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